The University of Chicago
Founded by John D. Rockefeller

Recognition: A Logical and Experimental Study

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A DISSERTATION

Submitted to the Faculty
of the
Graduate School of Arts and Literature
in Candidacy for the Degree of
Doctor of Philosophy

[Department of Psychology]

By
ROBERTS BISHOP OWEN

CHICAGO, 1914

Published as Monograph Supplement No. 86 of the Psychological Review

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I. HISTORICAL RÉSUMÉ OF THEORIES OF PERCEPTION

There is no sphere of psychology where greater diversity of opinion is manifest than in the discussions concerning the phenomenon of recognition. Not only have a large number of radically different explanatory theories been advanced, but experimental research has led to few universally accepted conclusions. The present monograph represents an attempt to clear up some of the existing confusion on the basis of logical analysis and of experimental data. Before proceeding to this part of the work, however, we shall survey briefly the main theories of recognition as they have been propounded and point out how they have been affected by the results of laboratory investigations. Inasmuch as recognition takes place not only in the perceptual but also in the ideational sphere, the discussion will be divided into two corresponding sections. This is necessitated by the fact that, up to the present time, practically all psychologists have considered these two problems as distinct, and have accorded each a separate treatment.

(1) Theories of Perceptual Recognition

We find that we can divide these theories into three groups.* First some authors regard recognition as a function of a peculiarity of content that is sui-generis—*viz.:* an unique feeling of familiarity, only encountered where judgments of oldness are affirmed (or at least are possible). Secondly, other writers agree with those just mentioned in regarding recognition as a function of a peculiarity of content, but do not regard this content as a feeling of familiarity but as some specific variation in the prop-

*In classifying writers, expositions given without qualification are assumed to be regarded by the writers as universally valid. It has to be taken for granted that if a writer means a description only to apply to some and not to all instances, he has indicated this qualification explicitly in some fashion or other.

erties or mode of behavior of processes which would be functioning in a different way if recognition did not take place, *e.g.*, the reproduction of images or the movement of the attention over a field of interest. Writers of the third school differ from all those previously mentioned in that they reject the conception of a content basis for the cognitive classification of material as old or as new. Recognition is in its essence a consciousness of reference, a meaning, an awareness of relationships between the present and the past, which is not dependent on or due to the appearance of a feeling of familiarity or any other like phase of the extant situation. The consciousness of reference is unmediated, is sufficient unto itself. It will be more convenient to discuss the second group first.

a. Recognition as a Function of Peculiarities of Content Other Than a Feeling of Familiarity.

1. *Revived Image or Impression.* One of the earliest theories that we find, the one in fact that in spite of occasional opposition maintained itself until 1889 as the predominant doctrine, states that the recognition of a percept is due to the revival of former impressions of the object or of its image. Although, of course, these two classes of psychological phenomena are sharply distinguished today, yet as long as the realistic and associational schools held sway, the two were not differentiated, at least not with any clearness. We can then treat theories dealing with them as identical in intent unless a distinction is explicitly made. There are two different ways in which this revived content may be regarded as functioning. Either the new percept and the resurrected presentation are distinct and recognition is explained as the result of the conscious comparison of the two, or the image or impression is assimilated to, or fused with, the percept in such a fashion that it never enjoys an independent existence and its presence is only indicated to the introspecting subject by the fact that recognition has taken place.

The earliest representative of this view that I have come across is Ampère,[1] who says that recognition takes place as a

[1] *Essai sur la Philosophie des Sciences,* 1834.

consequence of the fusion of a percept and its image. Bain, the leader of the associationalist school, and Spencer who had much in common with this general point of view, also maintained practically the same doctrine. Says Bain[2] "In the perfect identity between a present and a past impression, the past is recovered and fused with the present instantaneously and surely. So quick and unfaltering is the process that we lose sight of it altogether." Where the identity is not perfect, it is a chance whether the new stimulus will be identified, as it may not reproduce the old impression. Spencer's[3] doctrine is very similar. "Thus, the fundamental law of the association of relations, like the fundamental law of the association of feelings, is that each at the moment of presentation aggregates with its like in past experience. The act of recognition and the act of association are two aspects of the same act." Volkmann,[4] representing the Herbartian school, states that recognition is the result of the calling out of a reproduced idea by a presented object. If the two are totally alike, they fuse, and the whole process is dissolved in a feeling of 'Förderung', best translated perhaps as "mutual reinforcement." When the identity is not perfect, the fusion apparently does not take place, but as a result of the difference there is a simultaneous stimulation and repression of the reproduced by the reproducing content, and a consequent series of fluctuations in the latter.

We find the same theory appearing among men of a different outlook. Munk,[5] the physiologist, thinks of recognition as the result of a conscious comparison of the percept and its image. Here for the first time, the reproduced content is regarded as being something distinct from the new impression. The words fusion, assimilation, Verschmeltzung (Volkmann) indicated that the image or revived impression is generally blended with the percept. In fact, its presence is only indicated to the subject by the act of recognition itself. But in the case now before us the reproduced content is itself within the sphere of observable pro-

[2] *Senses and Intellect,* 3rd edition, 1868, p. 460.
[3] *Principles of Psychology,* 1892, I, p. 269.
[4] *Lehrbuch der Psychologie,* 1884, I, p. 414.
[5] Quoted by Külpe, *Psychology,* 1895, p. 171.

cesses and a conscious comparison is possible. The same assumption is found in other early experimentalists. Wolfe,[6] using the recognition method for testing the memory of tones, assumed on purely logical grounds that conscious comparison between the sensation and its image takes place. Höffding[7] is the most consistent and careful formulator of this theory that we have. He says that all recognition rests on a connection (Verbindung) between a stimulus and the corresponding image. In many cases the latter does not enjoy an independent existence, *i.e.*, cannot be introspectively isolated. This is the condition met with where we have the so-called unmediated recognition. The only thing that distinguishes the represented content from a novel one is the presence of a simple unanalyzable quality, the Bekanntheitsqualität. In seeking the basis of this we can represent the process from a psychological point of view by a formula. Let A represent the present stimulus, and a an image, surviving from an earlier experience. Then the formula for recognition would be $\left[\frac{A}{a}\right]$, the brackets indicating that fusion takes place. The two aspects A and a are only logically isolable and the statement in its ultimate analysis means that the result of the earlier presentation of A which leads to recognition is the same as that which under other conditions renders a *bona fide* reproduction of a possible. This would occur, for instance, when some stimulus B arouses the image a as a result of association by contiguity. In addition to these cases of unmediated recognition, Höffding admits that there are instances where the reaction is to be explained in the manner set forth by Lehmann (see below), and calls the phenomenon successive recognition.

These doctrines all see in association by similarity the basis of the revival of the image by the percept. In 1889, however, we find Lehmann[8] coming forward in defense of a theory founded on association by contiguity. The view current at the time among those who considered the latter a law of secondary rank was that, as a new impression A had never been experienced

[6] *Phil. Stud.* III, 1886, p. 534.
[7] *Vierteljhrsch. f. Wissen. Phil.*, XIII, 1889, p. 420.
[8] *Phil. Stud.* V, 1889, p. 96.

in company with any of the images that were supposed to accrue to it as a result of association by contiguity, it was only by the rearousal of *a* that the process could be conceived as taking place. *A* would call out *a* through the force of similarity and then *b, c, d,* etc., images of contiguous associates of *a,* would put in an appearance. In answering this, Lehmann says, "Da eine Vorstellung *A* und eine reproducirte Vorstellung *a* ganz derselbe Zustand ist und in demselben moment nur durch verschiedene Ursachen hervorgerufen, so ist es durchaus unverständlich wie der eine dieser Zustände eine Wirkung, die Reproduction von *b,* sollte hervorrufen können, welche der andere nicht hervorbringen könnte." Not only is the supposedly necessary intervention of the image *a* a fiction, but the doctrine is not even called for as a working hypothesis to render intelligible certain processes such as the recognitive reaction. The latter can easily be understood as due to the working of the principle of contiguity. We must, says Lehmann, distinguish between sensations incapable of further analysis and perceptions which are complex and which are the result of a gradual upbuilding in time, in other words, are not sensed as a whole simultaneously. In the case of the latter, the phenomenon of recognition is explained as follows. I experience the sensation *A* which is part of a more complex object in the process of being perceived, and this as a result of association by contiguity arouses anticipatory images, *b, c, d,* etc. If then, in the further experience of the object I encounter the sensations *B, C, D,* etc., corresponding to these images, recognition takes place. If the object is frequently encountered, one such identification is sufficient.

It must be understood that we are not ordinarily conscious of these so-called Congruenzschätzungen, by which the identity of the image and the object is established. In fact we seem here to be practically in the presence of Höffding's doctrine of unmediated recognition, the only difference being that a different law of association is regarded as the operative cause of the reaction. The whole doctrine so far elaborated is an explanation

of "simple" recognition, that is, the cases where there is no consciousness of the circumstances under which the previous experiencing of the known content took place. On the other hand, when this last is present, we have Wiedererkennen mit Umständen. This involves, besides the reproduction of the images whose identification with the repeated elements of content gives the essence of the reaction, the revival of details representing the conditions obtaining at the time of the earlier experience. We have then the complete formula.

A+B+.....f+g+h
| | |
F+G+H +m+n
Recognition Umständen

In cases where percepts are recognized but the process of anticipation by an image and its subsequent justification by the actual experience of the corresponding sensation cannot be introspectively observed, *i.e.*, where we encounter what Höffding calls unmediated recognition which does not involve any isolable image or other associates, Lehmann posits the occurrence of the whole action in the region of the subconscious. This seems to carry us but little beyond Höffding. Still there is one great advantage in the general form of statement here presented, in that the process is capable of being, on occasion, introspectively observed. This gives us, then, something more than a purely hypothetical mode of explanation.

In the case of simple sensations, *i.e.*, of impressions which on account of their simplicity do not admit of a process of successive anticipations and verifications during the apprehension of their content, Lehmann advances two modes of explanation. In the first place it may be due to a comparison between a sensation and a memory image of it that has been aroused in anticipation, *i.e.*, before and not subsequent to the presentation of the repeated stimulus. Secondly, where this is not possible, the calling out of a name by association is sufficient to lead to the classification of the stimulus as known. In this latter case, however, we do not have a true recognition, as no comparison takes place, a

process which, as has been shown, is always involved. Lehmann denies the occurrence of the unmediated recognitive reaction with sensations.

Although the work in which it occurs has been superceded by his later books, we may cite Baldwin's statements in his "Senses and Intellect" as an illustration of the predominant tendency of the time which we are considering. He says, "In the case of the second perception of an object, its recognition is accomplished by means of an image which is already recognized. We institute a comparison between the percept and the image, and pronounce them the same or similar."[9] Sully also adds himself to the long list of professors of the faith. Although he seems to recognize in one place that there is much truth in Lehmann's strictures against a naïve realism which regards sensations as continuing to exist after they have ceased to be experienced and of being capable of being revived, he cannot forego the temptation to fall into the same error. "The simplest form of assimilation is to be found in that process by which a present sensation is reapprehended or recognized as familiar. . . . Such assimilation is automatic or "unconscious" in the sense that there is no separate and distinct recalling of a past sensation, and clear awareness of the relation of the present sensation to its predecessor. . . . What takes place is the calling up by a present sensation of the trace or residuum of a past sensation . . . , which trace merges in or coalesces with the new sensation, being discernible only through the aspect of familiarity which it imparts to the sensation."[10] Jodl[11] also enunciates practically the same doctrine. He speaks about the Zusammenschmelzen of a perception with one of the same content reproduced by it, as being the basis of recognition. On occasion, the process may take place in such a way as to be introspectively observable. This is true where there is some difficulty involved in the reaction.

Watt's[12] recently promulgated doctrine of integration of at-

[9] *L. C.*, 2nd edition, pp. 172-3.
[10] *The Human Mind*, I, 1892, p. 181.
[11] *Lehrbuch der Psychologie*, II, 2nd ed., 1903, p. 129.
[12] *Brit. J. of Psych.*, IV, 1911, p. 127.

tributes is clearly related to theories of this type. The main difference is that it is not the percept and the image in their entirety that fuse but one of their attributes. Watt wants to build up a causal science of psychology, which shall not need to appeal to any principles of explanation and combination outside of its own field. Complex experiences of a peculiar indescribable type, evident only after direct acquaintance which are called secondary modifications of experience, are to be viewed as resulting from the integration and linking together of sensations due to fusion of attributes in respect to which the sensations differ. Recognition is regarded as such a secondary modification of experience, due to the integration of the differing attributes of order of experiences which are in recurrence. It is exceedingly hard for me to understand exactly what Watt actually means by the attribute of order in this connection. It seems to be an attribute of sensations whereby they are distinguished even when possessed of the same quality, intensity and extensity. The basis for the distinction lies in an inherent aspect of arrangement, whereby the order of every sensation is fixed relatively to all others present. Where recognition is concerned, the term refers, I should judge, to position in a temporal series. This explanation of recognition as due to the integration of the order attributes of experience logically implies that the earlier one should be revived. To account for the alleged cases in which no such revival can be indicated, Watt suggests that an integration is possible when the remaining qualities and other attributes are very much in the background. It may require a lengthy search to reveal the presence of the qualities, extensities, etc. whose order is being integrated. Experiment has shown that the orders of objects may be present and admitted introspectively without the qualities being distinctly observable. Attributes are, therefore, capable of more or less separation in their appearance in consciousness. The probability of this explanation would be even greater where, as in recognition, the attention is concerned primarily with the attribute of order alone. "We may maintain then that recognition is based upon the psychological integration

of the order aspects of percepts although it is often present before associated percepts can be identified introspectively." Still eventual reproduction is implied.

The employment of experimental methods has given us evidence concerning the validity of the doctrine that recognition is to be explained as due to a comparison with a revived image or impression. We have already mentioned the work of Wolfe which is of interest largely on account of its pioneer character. The method was purely objective (no introspective evidence was sought for) and the work therefore contributes nothing more than a mere assumption. Lehmann, also, in his first work[13] argues from the results of experiments in which no careful introspective evidence is accumulated. The purpose underlying his researches was to bring forward proof of his own theory as opposed to any doctrine which would explain recognition as due to the calling out of an image by the corresponding percept as a result of the working of the law of association by similarity. Using the method of recognition in a series of tests with gray disks, he found that the smaller the difference between the stimuli among which the standard had to be recognized, the greater was the number of erroneous judgments. The same result is procured by an increase in the number of different stimuli employed. Lehmann assumes that in these cases a memory image is carried over from the initial presentation, and that the accepting or rejecting of the second stimulus is the result of a direct comparison. This assumption is of course compatible with the results mentioned. He found in addition that the individual variations in correctness of judgment were directly correlated with the general ability to remember either concrete data of sense on the one hand, or abstractions on the other. A subject with a memory especially adapted to retaining material of the former type was found to make more correct judgments than a subject with a mathematical bent. This result would also naturally be expected provided recognition takes place as assumed. In addition, it was found that the standard stimulus which is presented much more frequently in the course of an experiment than

[13] *Phil. Stud.*, V, 1889, p. 96.

any of the variants was not more likely to be the subject of a correct judgment when re-presented than were any of the latter. Rather in the case of one subject the percentage of correct judgments was the same for all stimuli in the test trials, and the other estimated the variants more correctly. This Lehmann claimed is in accord with his own hypothesis, as the strengthening of the anticipatory memory image ought to work to reduce errors in all directions, while if we assume that recognition is the result of the fusion of the images of former impressions (called out subsequent to the presentation of the stimulus) with the new content the result should be different. Under these conditions the represented standard should find waiting to receive it a constantly increasing number of images, which should increase the percentage of correct judgments in its case, while the variants should receive no assistance from the circumstance. This, then, is the first evidence that we find brought forward in favor of any theory which would explain recognition as the result of a conscious comparison between an *anticipatory* image and an object. The technique, however, is not well adapted to bring out the actual subjective processes involved, inasmuch as no introspective evidence is sought for.

In 1895, Bourdon[14] working with series of words in which one individual was repeated, found that recognition often occurred without representation intervening. Bentley[15] also brings forward evidence to the same effect. He employed gray disks and used the methods of recognition, of continuous change, and of right and wrong cases. His general conclusion, based on introspective reports of his subjects, was that recognition often takes place without a comparison with a memory image. This does not mean that this may not occur, especially where the subject is of a strongly visual type. Still when no active reproduction was possible, where no vestige of an image survived the interval, the subjects could decide quickly and with confidence. F. Angell,[16] working with tones, used various distractions. In-

[14] *Rev. Phil.*, 40, 1895, p. 153.
[15] *Am. J. of Psych.*, XI, 1899-1900, p. 1.
[16] *Am. J. of Psych.*, XI and XII, 1899-1900, p. 67, and 1900-1901, p. 58.

trospective evidence played but little part in his conclusions, which were that the majority of the judgments in his experiments did not involve a comparison with an image. As has been said, however, we have here again an argument based in the main on objective methods of experimentation. Whipple[17] gives us an exhaustive introspective analysis of the processes involved in the recognition of tones. He concludes that the presence of the auditory image is not necessary to the judgments of either equality or difference. On the other hand, a comparison actually does take place in certain cases.

Abramowski and Katzaroff also present evidence that images are not necessary for the recognitive reaction. One piece of work by the former[18] contains introspective evidence, and is hence of value. The second paper,[19] being of a purely objective character, gives us but little insight into the actual processes involved. Katzaroff,[20] who used geometric designs as stimuli, is concerned with the introspective evidence of his subjects. He concludes that while images may be present in some cases of recognition, their appearance constitutes a second period in the total reaction, the immediate conscious phenomenon being a feeling of familiarity which is the ultimate basis for the acceptance of the stimulus. He finds among other interesting things, that even when images are present recognition may not take place, and that, in other instances, the presence of contradictory images is not sufficient to mediate a judgment of newness. These facts in themselves are, of course, strong evidence that any attempt to explain the recognitive reaction as the result of the *mere* appearance of an image and a judgment of novelty as the result of the *mere* absence of an image must end in failure. For we find that the concomitant variation is not in any way thoroughgoing. Meumann[21] also reports judgments where images are not concerned, at least as far as the subject can determine on introspective

[17] *Am. J. of Psych.*, XII, 1900-1901, p. 409, and XIII, 1902, p. 219.
[18] *Arch. de Psych.*, IX, 1910, p. 1.
[19] *Journal de Psych.*, VII, 1910, p. 301.
[20] *Arch. de Psych.*, XI, 1911, p. 1.
[21] *Arch. f. die Ges. Psych.*, XX, 1911, p. 36.

grounds. The same conclusion is also indicated by Moore,[22] who employed a very interesting technique. He presented to his subjects series of groups of figures in which one figure was always repeated. The subject was not required to be able to report what figure was repeated, but only that such repetition had taken place. Introspection concerning the processes involved was then called for. Moore found that the subject might be aware that *some* figure was being repeated, although he had little or no knowledge concerning its form. Strong,[23] while insisting on the necessity of some kind of mediating content, reports many instances in which images were not observed.

This, then, completes the list of the important experiments which have brought forward evidence in regard to the tenability of the hypothesis that recognition is invariably a function of revived images. The evidence seems overwhelmingly conclusive that these latter, while they may on occasion serve to mediate judgments of oldness are by no means necessary for the appearance of the latter. Furthermore, Katzaroff has clearly shown that if images are to be considered as occasional criteria for the judgments of old, some additional differentiating mark must be established which characterizes images capable of mediating recognition as opposed to those correlated with judgments of novelty. It should, of course, be noted that none of this evidence can directly refute a doctrine which bases its faith on fused images. The latter are absolutely insusceptible of introspective isolation, and are of a purely hypothetical and explanatory character. Inasmuch then as they cannot be observed, they are for the experimentalist non-existent; and we may relegate them once and for all to the sphere of useless incumbrances. It is far better to say that on occasion (provided of course no other criteria are present) recognition consists in a mere consciousness of reference in which case the theories would belong to our third group, than to drag in a labored hypothesis that smacks strongly of old naïve realistic and atomistic preconceptions.

2. *Recognition as a Function of the Appearance of Associates.*

[22] *Atti di V Congr. Intern. di Psych. in Roma*, p. 286.

[23] *Psych. Rev.*, XX, 1913, 33, p. 1.

—In contradistinction to the type of theory we have just been discussing, the general teachings of the writers who belong to this second school is that recognition is due, not to the revival of the image or impression of the recognized object itself, but to the appearance of associated ideas or images (of other objects). This also is a doctrine of great age. We find Wolff[24] in the middle of the eighteenth century proclaiming the essence of it. His teaching may be summarized in the assertion that the revival of images and ideas representing a former experience, of which the present percept was a part, is the basis of the recognition of the latter. Novelty would, presumably, be due to the absence of all such associates. Lehmann,[25] also, although his main theory is one calling for the revival of images of the object itself, has one supplementary hypothesis which naturally falls under this class. The recognition of simple sensations under conditions which forbid the anticipatory arousal of an image is regarded as due to the ability to classify or label, which he calls Wiedererkennen durch Bestimmung. This latter is a case of association by contiguity.

Exner's teaching cannot be classified as belonging to any of our set types, but claims rather a number of affiliations. One of the main agencies in mediating the reference of a present experience to a previous similar one is the Auftreten von Nebenerregungen in the cortex, which, in so far as it is accompanied by consciousness, is to be interpreted as the Auftreten of associated Empfindungen. A complete understanding of Exner's theory involves the conception of the Bahnung. Just as one excitation in the central nervous system can hinder or prevent entirely the "running off" of another excitation, so the contrary condition may be realized, and this Ablauf may be assisted. This is due to the clearing (frei machen) by the action of another current of the tracts to be traversed. This phenomenon of facilitation is called Bahnung.[26] Turning the attention to either a sensory impression, a movement, or a memory image renders the paths concerned especially responsive to incoming

[24] *Psychologia Empirica,* Sec. 174, 1738.
[25] *Phil. Stud.,* VII, 1892, p. 169.
[26] *Entw. Zu e. phys. Erklärung der Psych. Erscheinungen,* 1894, p. 76 ff.

currents while the conducting ability of other areas is decreased.[27] Furthermore, there is no confusion owing to the inability to distinguish between an increased state of excitation due to this Bahnung through the act of attention, and one due to an increased intensity of the stimulus.[28] The subject knows what the occasion for the change is. Applying the doctrine to the recognitive reaction, we find in the first place that the repetition of a stimulus increases the intensity of the excitation of the tracts concerned without a corresponding increase in the objective intensity of the stimulus. Also, the recognitive consciousness is distinguished by the presence of images associated with the actual sensations as a result of having been experienced together with them on some previous occasion. That there are no objective grounds for the appearance of these images, *i.e.* that they are not functions of a stimulus, is known to the subject, one might almost say, immediately. For he is aware that there is no corresponding arousal of the sub-cortical tracts, a condition which would exist in case the content were traceable to stimulation from without.[29]

Stout and James also are well-known exponents of this general line of argument. Stout says that as a result of the recurrence of a like impression in a dissimilar context, both it and its corresponding disposition are modified. This is due to the presence of reproductive tendencies which owe their origin to sensations and percepts that have been experienced at some former time as companions of the recognized content. Though these may not be strong enough to cause the revival of the corresponding previous impression, they give rise to an increased complexity in the represented sensations.[30] James makes a distinction between memory and recognition proper. "And to refer any special fact to the past epoch is to think that fact with the names and events which characterizes its dates, to think it, in short, with a lot of contiguous associates."[31] This is memory proper.

[27] *Entw. Zu e. phys. Erklärung der Psych. Erscheinungen,* 1894, p. 16 ff.
[28] *Ibid.,* p. 168.
[29] *Ibid.* p. 241.
[30] *Analytic Psych.,* II, 1896, pp. 10-11.
[31] *Psychology,* I, 1905, p. 650.

When, however, a phenomenon is met with often, in great varieties of contexts, this setting of associates fails to come up. Rather the latter form too confused a cloud. All that we have is a sense that there are associates, a doctrine which approaches very closely the theories which posit unmediated meanings. With complex phenomena, the different elements may be regarded as being mutually associated by contiguity. If then the object is encountered for the second time, an "intrinsic play of mutual associations among the parts would give a character of ease to familiar percepts which would make of them a distinct subjective class."[32] This, then, is the phenomenon of recognition as distinguished from explicit memory.

Two varieties of this general type of theory are of sufficient importance to warrant special notice. Ribot[33] and James[34] believe that among the contiguous associates are always ideas of the date or time when the previous contact with the recognized content occurred. As has been pointed out, however, the latter author would assert this only in the case of memory proper. James,[35] James Mill,[36] and Claparède[37] all declare that recognition involves a consciousness of self. To recognize is to refer the object to a previous experience which I myself have had, to realize that I am in the presence of a bit of content which has been incorporated into a previous moment of my existence.

Betz's[38] theory of the Einstellung also belongs here. As opposed to Vorstellung which denotes the elements of content which are contributed as a result of stimulation from without, he used the word Einstellung to denote the reaction to the stimulus on the part of the subject. These reactions include the arousal of pleasure-pain components, bodily changes as a direct result of the stimulation, the establishment of apperceptive and emotional relations. Wherever, as a result of past experience,

[32] *L. C., I.*, p. 674.
[33] *Diseases of Memory*, 1893, p. 46 ff.
[34] *L. C., I.*, p. 650.
[35] *L. C.*
[36] *Analysis of the Phen. of the Human Mind*, Vol. I, 2nd ed., 1878, p. 328.
[37] *Arch. de Psych.*, XI, 1911, p. 79.
[38] *Arch. f. die Ges. Psychologie*, XVII, 1910, p. 266.

a stimulus arouses in me certain reactions of the kind described, for which no justification can be discovered in the present nature of the content itself, and which must therefore be regarded as a carried-over Einstellung, recognition will take place. Betz observed several cases in his own experience that tended to justify the hypothesis. Encountering a man on the street who was vaguely familiar, Betz found that there was a slight tendency to smile set up. Nothing about the existing situation could be conceived as being the adequate cause of the reaction. Later on, Betz remembered an amusing incident in a street car in which the man had figured conspicuously. The re-instatement of the Einstellung unjustified by present conditions had been the cause for the appearance of the past reference.

The experimental evidence concerning these doctrines is far from unanimous. Lehmann,[39] in the work already cited, brings forward proof that the recognition of simple sensations, in cases where the arousal of an anticipatory image cannot be posited, must be due to the ability to name. He employed three series of gray disks, in one of which there were five individuals, the outer limits being black and white, and the three intervening grays being separated from the extremes and from each other by equal steps. In a second series there were six disks, and in a third nine. The disks of a series were presented in the order of brightness to the subject, and then, later, one by one at random, and he was asked to give the place in which each had appeared at first. If we assume with Lehmann that there are in general five descriptive names that we are capable of using in distinguishing the members of a series of shades of gray, and if naming is a means of recognizing, we should expect to find that the series containing five members would be the locus of the greatest number of correct judgments, and the series of nine of the fewest. This was borne out by the results obtained. In the series of nine, the percentage of correct estimates was reduced to a number that practically corresponded to that representing chance.

[39] *Phil. Stud.*, V, 1889, p. 96.

In a later series[40] of experiments on the recognition of smells, Lehmann found that in nearly all cases the appearance of associated ideas marked those experiences that were classified as known. Of especial importance were the reproductions of names. Lehmann divided associations into those that were wrong, *i.e.*, could never have been accompaniments of previous experiences of the recognized smell, and those that were right, *i.e.*, were true reproductions. He found that in the great majority of instances where the content was classed as new, no correct reproductions were present while the reverse was true where recognition took place. Where the stimulus was recognized and no reproduced content was observable, Lehmann fell back on the field of the subconscious. When the associates remain below the threshold we have practically the immediate recognition of Höffding.

Bentley[41] also appears to bring forward evidence to the same effect. He says that the appearance of stimuli calling forth the same verbal description as the standard was the signal for a recognitive reaction. In fact, the presence of some kind of mediating associates, such as generic images, or verbal connotations, or ideas of persons, etc., seems in general, though not always, to have been the rule with his subjects where judgments of old were returned. Gamble and Calkins,[42] on the other hand, who undertook to test Lehmann's work, report decidedly different results. These authors found that (1) unknown stimuli are accompanied by associated ideas; (2) recognition occurred when there were no associates, at least none clear enough to be observable; (3) where the order was noted, the associates generally appeared after the decision. In another series of experiments[43] with visual and olfactory stimuli, the authors found reason for questioning Lehmann's conclusions concerning the value of naming in mediating recognition. Evidence tending towards the same conclusion is cited by Abramowski,[44] who found that the

[40] *Phil. Stud.*, VII, 1892, p. 169.
[41] *L. C.*
[42] *Zeit. f. Phys. und Psych.*, XXXII, 1903, p. 177.
[43] *Zeit., etc.*, XXXIII, 1903, p. 161.
[44] *L. C.*

work of thought in analysing and naming is not necessary for judgments of identity. Katzaroff,[45] although he observes that, on occasion, associations carried over from the earlier experience are regarded by the subject as being indicative of the previous presence of the stimulus, nevertheless believes that a feeling of familiarity is an act which precedes every other psychic act and hence that associations even when they are present, are, after all, but secondary phenomena. He brings forward in support of his contentions the fact that for his subjects at least, many recognitions take place where no content except a feeling of familiarity could be isolated, that, on occasion, the presence of specific memory of details may fail to lead to a judgment of oldness, and that, since memories of an explicit character are attached only to certain details, they cannot be regarded as mediating a recognition of the whole.

In Meumann[46] and Strong[47] we again find evidence that associations are generally characteristic of old content and lack of them of new. Meumann says that with a new stimulus there is a suspension of the flow of ideas and images. The unknown is not the center for the arousal of a series of reproductions, as is the known. It is very difficult during the early stages of learning, however, to discover the presence of even obscure reproductions, and there are cases where there seems to be absolutely no structuralistic basis for the judgment returned. We seem to be here concerned with an immediate reference to the past. Meumann, however, believes that in these instances it is probable that there are certain obscure criteria present, especially Formalgefühle and organic sensations. Thus, though it is not true that recognition always involves associates, on the whole Meumann seems to show that they are habitually in evidence. The same may be said of Strong. Strong does not limit the associates to mere ideas, but speaks also of emotions, motor response, etc. Nevertheless, he is explicit in stating that recognition seems to depend on the fact that the same mental process that accom-

[45] *L. C.*
[46] *L. C.*
[47] *L. C.*

panied the stimulus at the time of its initial presentation is revived.

We see then that all experimenters report cases of recognition where associations are present, and also others where they are lacking. The number of the latter is relatively small, however, except in the work of Abramowski and Katzaroff. The main point of disagreement is as to how they are to be interpreted. Lehmann would bring in associative activity in the sphere of the subconscious. Gamble and Calkins would admit them as valid exceptions to any general statement of the rôle of associates in recognition. Katzaroff would read them out of court altogether in so far as they claim to be unique and would posit an antecedent and ultimate feeling of familiarity as always present. The evidence presented by Gamble and Calkins that unrecognized content may arouse associates, and by Katzaroff that the presence of specific memories will not invariably lead to judgments of old, tends to show that the mere appearance of the latter cannot furnish a basis of differentiating old and new, at least not with all subjects.

3. *Homophonie.*—Semon[48] has propounded a theory based on his doctrine of the mneme. When like stimuli are applied simultaneously to corresponding points of a sensitive area, the resulting sensations are rendered more vivid. Whatever differences may exist between them are thrown into relatively sharp relief. This reciprocal influence is known by the term Homophonie. When we have a simultaneous excitation of a sensation and its mnemic trace or engram, the same phenomenon is operative and we experience a keen consciousness of the difference in the time order of the original excitations concerned. The two processes, the sensation and the mnemical impression, do not fuse, but rather there is a real relation of co-existence in time. This peculiar case of Homophonie is recorded in consciousness as the recognitive reaction which in its essence consists of a reference to the past. Occasionally we have comparison with a memory image.

[48] *Die Mneme,* 1908; *Die Mnemische Empfindungen,* 1909, pp. 313, 334, 382.

4. *Habit.*—Bergson[49] has lately developed a theory based, it would seem, on what we may call physiological recognition. A man who uses a hammer to drive nails, and a tennis racket to play with certainly does not recognize in the true sense of the word; and yet just in so far as the peculiarly appropriate reactions are set up we have something which in its essence is related to recognition. Bergson seems to have taken his cue from reactions of this type. The basis of recognition, in his estimation, is to be sought in the consciousness of a well-regulated motor reaction to a stimulus. At first our movements in the presence of an unfamiliar object are uncertain. When we become too accustomed to dealing with it, perception is useless, the reaction being purely automatic. There is, however, an intermediate stage where the object is still consciously perceived, and where at the same time a high degree of automaticity of the responding movements has been perfected. It is the consciousness of this well-regulated motor reaction that lies at the basis of our classifying the stimulus as known. This is instantaneous recognition, of which the body is capable by itself. In the majority of cases, however, there are, in addition, memory images which go out to meet the incoming impression.

For Baldwin assimilation is at the bottom of recognition.[50] And "in assimilation we have the general statement of all the forms, nets, modes of grouping which old elements of mental content come to bring to impose upon the new." In turn "this assimilation is due to the tendency of a new sensory process to be drawn off into preformed motor reactions." One form of motor discharge due to a stimulus is a more or less consolidated motor reaction fixed by natural selection, and this is what we ordinarily call attention. In the case of a re-presented content, the peculiar movements that are concerned in attending to that specific object are more easily executed. This surely is evidence of the working of the principle of habit. Moreover a train of associated images is reinstated.

5. *Feeling of Ease.*—Finally some authors attribute recogni-

[49] *Matter and Memory,* 1912, p. 109.

[50] *Mental Development,* 3rd ed., 1906, p. 292 ff.

tion to the sense of ease which attends the subsequent running off of a nervous process as contrasted with its first arousal. The recurring currents are traversing paths which have been opened up and worn, so to speak, and in accordance with the law of habit they encounter less resistance in their course. The whole process is facilitated. Corresponding to this increased automaticity on the physiological side, we have a feeling of ease in connection with the processes involved in perception on the psychological side. This, in turn, serves as a clue for the classification of the stimulus as known. (In some cases the latter aspect is all that is mentioned, the physiological relations receiving no notice.) The earliest representative of the doctrine that I know of is Charles Bonnet.[51] Later writers are Maudsley,[52] Höffding,[53] Exner,[54] and, in a way, Theodor Lipps.[55] In the case of the latter the physiological substratum is not mentioned. The theory of the "Bahnung" is central in Exner's statement. A tract is "gebahnt" through the action of currents running over it, *i.e.*, the next excitation will so to speak find its way prepared for it. As a result, the same stimulus will, without any assistance from the attentive processes, cause a more intense excitation of the tracts concerned and this will in turn be registered in consciousness as ease of entrance into the focus. As was shown before, the source of this increased intensity will not be attributed to any added intensity of the stimulus itself. The doctrine of Lipps involves his conception of Energie. He speaks of the Verschmeltzung of the Vorstellung with the Empfindung, but goes on to specify that what he actually means by this is that the Empfindung appears with a higher degree of energy, and energy means assertiveness in consciousness, the tendency to force an appearance in the focus, regardless of the like tendency of other content. In addition, repetition allows the attention to move from one part of a content to the other with less hindrance. A

[51] *Essai de Psych.* 1775, Ch. V.
[52] *The Phys. of Mind,* 1889, p. 513.
[53] *L. C.*
[54] *L. C.* p. 240.
[55] *Grundtatsachen des Seelenlebens,* 1383, p. 229 ff.; 189 ff.

novel detail causes the attention to be held up, the sweep over a series of habitual relations being impeded. It should be noted that Lipps does not explicitly state that these factors lie at the basis of recognition, but we may, I believe, assume from the general discussion that this would be his teaching.

These doctrines have some experimental evidence which may be cited in their favor. Bourdon, in the work already mentioned, says that a known object is more rapidly, more profoundly and more easily perceived than is an unknown one. Meumann also says that in apperceiving a new content we encounter an experience of interruption and of starting which partakes somewhat of the character of a slight feeling of fright. When the appearance of a new syllable is unexpected, the phenomenon is noticeably tied up with lack of overt motor activity, the innervation of antagonistic muscle groups and a stiff, upright posture of the body being involved. The speech movements may be temporarily impeded, resulting in a delay in the expression of the judgment. There is also a suspension of the flow of ideas and images, the new stimulus not fitting right in as a link in the chain but rather breaking in on the process. In contrast to this we find that the pattern of consciousness initiated by the appearance of known syllables is always characterized by an easy running off of the psychological processes. Perception as such is easier, as is also the articulation of the syllables. Again the stimulus fits right into the series of ideas and constitutes a center for the arousal of associations.

b. *Recognition as a Function of a Feeling of Familiarity:*

Theories of this type all posit the appearance of a unique feeling as the basic element in recognition. By feeling we understand either an ultimate unanalyzable form of consciousness which is different from sensation or image, or a complex of such processes and of certain sensations, usually organic, in the sense indicated by Titchener. The latter point of view would not, I take it, deny the uniqueness and individuality of any particular type of complex. A certain combination of the two necessary elements, as in the case of the feeling of familiarity, for in-

stance is a combination thoroughly peculiar and isolable. Again the feeling of familiarity may be the result of other factors, but these are never in themselves sufficient to complete the recognitive reaction. The peculiar tonus is necessary if recognition is to take place.

We find among the defenders of this theory many of the most famous psychologists of modern times. Wundt[56] speaks of a Wiedererkennungsgefühl, and attributes its appearance to the assimilation of the recognized content by imaginal elements surviving from former experiences. When we have only encountered the object once before, the assimilation is brought about by the elements dating from the single earlier presentation. As in all cases of assimilation proper, we are unable to observe the reproduced constituents in the total complex. If the object has been met with many times, all of the past impressions will contribute to the quota of reproduced content which is active in the assimilation, but the degree of participation in the process will vary. Sometimes it may even happen that there will be a temporal succession in the order in which the imaginal constituents put in an appearance. The elements that are first aroused may, then, be relatively subordinate and unusual attributes (Merkmale) of the object in question and may merely serve as introductory to the more important elements which carry out the assimilation. This latter phenomenon is indicated in consciousness by the appearance of the feeling of familiarity. Under the conditions just described, we are accustomed to say that we have mediate recognition, as the earliest reproduced content merely serves to usher in that responsible for the assimilation. In these cases we pass into the sphere of successive association, *i.e.*, the mediating images may be observed as independent contents of consciousness. It should be remembered, however, that the process always ends with an assimilation proper. One great variety of mediating content is composed of complications, that is, images which belong to a different sphere of sensation from that through which the stimulus is received.

[56] *Grundzüge der Phys. Psych.* III, 1903, 5th ed. pp. 535 ff.

Külpe[57] also, it appears to me, should be counted among those who are adherents of this doctrine concerning the feeling of familiarity, although at first sight this may seem a rather arbitrary classification. According to him recognition is of two kinds, direct and indirect. In the former there occurs merely a judgment expressive of familiarity, no reproduction of the sensations involved in previous experiences being occasioned; in the latter, such a reinstatement of factors repeating certain circumstances of the original situation, does occur. Direct recognition is characterized by the effectiveness of the represented stimulus for central excitation. Various local, temporal and conceptual ideas are aroused. In the case of a novel stimulus, on the other hand, such a network of associations is lacking. Also, there is a difference in mood between the known and the unknown. We find that this second factor is an invariable accompaniment of the recognitive consciousness, while the effectiveness for central excitation is often lacking. The mood appears, then, as the really basic consideration. Indirect recognition may be of two kinds. (1) The case where the environment of the represented object is also recognized. We have here really a series of direct recognitions. Only if the object is recognized because it occurs in a familiar setting, and not on its own account, is the recognition truly indirect. We have here no novel element introduced into the situation. All that is added is an inference from attendant circumstances. (2) The environment may be different, however, and in this case recognition takes place when the previous surroundings are recalled, *i.e.*, sensations representing them or knowledge about them are reproduced.

Titchener[58] also is found among the ranks of those who believe in a feeling of familiarity. He says, "The feeling of familiarity is the essential factor in recognizing. . . . The sensations and ideas of the associative and organic reaction then serve to make the recognition definite; the perception comes to us not merely as familiar, but with the especial familiarity of a named, placed, and dated experience." While these associated ideas are or

[57] *Psychology*, 1895, p. 170 ff.

[58] *Textbook of Psychology*, 1911, p. 407.

may be of assistance in recognizing, still as the reaction may take place when they are absent, they cannot be regarded as essential. The feeling of recognition itself is a feeling in the narrower sense, that is, a mental complex that can be analysed into a connected set of sensations and affective processes. The particular constituents are (1) diffuse organic sensations, (2) a pleasurable affective tone. When a stimulus is often repeated, the feeling of familiarity ceases to be aroused, and all that we find is direct apprehension, where the content is taken for granted.

Peillaube[59] also propounds a doctrine with reference to a feeling of familiarity. He, however, sees the basis of the affective reaction in a phenomenon which is an extension of the Bergsonian hypothesis to meet the requirements of cases where recognition occurs without any observable movements. Peillaube would attribute the presence of the feeling of familiarity to the fact that the repeated stimulus tends to arouse immediately with a relatively great amount of ease, a train of associated images and ideas which are closely knit together so as to give on the psychological level what closely resembles the phenomenon of habit in the physiological. The represented term comes into a field in which it immediately takes up old connections. As a result of this organized network into which the repeated stimulus comes we find a diminishing of the *choc interieur* which accompanies the entrance of a new stimulus into consciousness, and that is especially exemplified in surprise. As a result we have the "sentiment" of familiarity.

We have considerable experimental evidence on this matter. Bourdon concludes without a very careful analysis of the assumption involved, that recognition is an intellectual feeling, so-called, belonging in the same general class as feelings of doubt, etc. This feeling of familiarity is hard to analyse, as it is very fleeting and intangible. On the other hand, Bentley offers evidence which would tend to deny the necessity of the presence of any peculiar tone. Two of his three subjects failed to discover any mood whatsoever, and one subject never reported any

[59] *Les Images*, 1910.

organic sensations. Bentley regards this as being the direct result of his technique. Nevertheless, the fact remains that recognition took place without the factors in question being present. Whipple, however, speaks of the feeling of familiarity as being the basic consideration. It can be further analysed and shows in general two patterns. In some cases, we have a subjective indication in the variable tone itself, such as when the latter is spoken of as being "more graspable, appealing, louder, stronger, lingering along," etc. These terms seem to indicate the arousal of more or less definite complex sensations by the standard, the revival of which by the variable leads to identification, and reminds one of Külpe's effectiveness for central excitation. In the second place there may be indications from the observer's own body, such as would be illustrated by the phrases, "a glow of warmth," "a felt sense of ownership." Still Whipple found instances where none of these factors were present, the word content "known" or its equivalent being practically all that was involved in the reaction. The general evidence, therefore, of his work, while favorable to the habitual presence of the feeling of familiarity where recognition takes place, does not lead us to regard it as absolutely essential. Also, Whipple found that pleasantness seems to be the prevailing affective tone in such reactions, thus substantiating Titchener's doctrine.

Abramowski concludes as the result of his work, that recognition is the result of the appearance of an *unanalyzable* feeling which wells up immediately on the reappearance of the stimulus. Revival of the image, and the intellectual labor accompanying it, is a secondary phenomenon, which is not a condition of recognition, but sometimes accompanies it, and is a sort of psychic luxury. Katzaroff also believes in the existence of an ultimate unanalyzable feeling of familiarity, which, as a psychic act, precedes every other reaction in consciousness. Even in cases where recognition seems exclusively determined by images, associations, etc., Katzaroff believes that we must admit that there is an antecedent feeling of familiarity which the subject is unable to isolate introspectively. We have also introspective evidence which bears on the doctrine that recognized content is

accompanied by peculiar organic complexes which are different from those present with novel stimuli. Bentley found that for one of his subjects, no organic sensations could be introspectively observed. This is of course evidence against the doctrine. On the other hand, we find Gamble and Calkins speaking of a difference in the organic accompaniments involved in the two cases. Meumann also speaks of a peculiar feeling of unpleasantness, coupled with rather definite organic sensations, in the case of unknown stimuli, and of characteristic feelings and "organics" which are qualitatively related to weak feelings of pleasantness and to sensations indicating relaxation, in the case of repeated percepts. Sometimes these were incapable of being introspectively isolated, however. These last experiments together with those of Whipple may be considered as offering proof of the correctness of Titchener's contention that the feeling of familiarity can be analysed into affective processes and organic sensations.

All experimenters, even those who would posit a feeling of familiarity as the ultimate and essential factor in recognition, are forced to admit that there are instances where such a unique content is not introspectively observed. Whipple, Katzaroff, etc., however, believe in its existence even under these conditions, claiming that it escaped the subject, owing perhaps to its weak intensity. This view is, of course, highly speculative. Nevertheless, the experiments are in general favorable to the contention that an ultimate feeling is with most people normally involved when a content is judged old. Another point of disagreement is as to whether the familiarity tone is susceptible of further analysis. Katzaroff, Abramowski and Bourdon do not seem to think that it is, while Whipple is strongly inclined in the opposite direction. Meuman, also, although he does not use the phrase "feeling of familiarity," speaks of what is closely analogous to it from the Titchenerian point of view, when he mentions affective processes and organic sensations. Gamble and Calkins, Meumann, and Whipple all give support to Titchener's doctrine that the latter are habitually concerned in recognition. On the other hand, Bentley seems to offer evidence that with some subjects, at least, such a feeling of familiarity is non-existent.

c. *Recognition as an Ultimate Datum of Consciousness.*

The fact that the mind can refer content to the past is an ultimate fact for the psychologist. The meanings of oldness and of newness are as unanalyzable as is redness or warmth. This does not, however, necessarily signify that there is no peculiarity of content which can be pointed out as the invariable carrier of the reference. In discussing the doctrine of those who see in recognition a unique datum of consciousness, it is extremely difficult to know, in some cases, whether the author is merely insisting on the ultimate character of the cognitive distinction, or is in addition claiming that the latter has no structuralistic basis. In the case of percepts, there is inevitably such a basis in the fact that the recognized stimulus is actually (in the majority of cases) like a former experience, while one judged new is actually altered. For the subject, this similarity does not exist as an immediately observable datum, however, and the defenders of an ultimate consciousness of reference would deny the presence of other isolable criteria. In this connection, it should be understood that we are not regarding relational elements as content though they may rightly be considered to be such.

Going back to a time when the distinction between content and function was not explicitly formulated, we find that for the old faculty psychology, memory was an ultimate faculty of the mind. Reid, Hobbes, and Locke, all were adherents of the same general point of view. In more recent times, the doctrine has been defended by two different groups, a limited number of writers who are not believers in imageless thought, and the members of the Würzburg school and writers who are in sympathy with them and their theories. Among the former we cite Angell, who says, "This fact of recognition . . . seems to be an ultimate and unanalyzable property of consciousness."[60] He then adds that a feeling of familiarity is involved, that recognition is generally pleasant, and that the recognized content is often supplemented by associated images, but continues,[61] "In all cases of

[60] *Psychology*, 4th ed., 1908, p. 225.
[61] *Ibid.*, 228.

conscious recognition, however, it must be remembered that the mental act of explicit recognition is something unique; something which is not simply synonymous with the accompanying conditions which we have been describing." It would appear, then, that Angell is merely insisting on the ultimate character of past reference, a fact which is undeniable. He admits, however, a content basis, a feeling of familiarity. Ebbinghaus,[62] though he does not explicitly name recognition, would, I believe, logically be led to class it with the consciousness of similarity, difference, etc., as one of the "general attributes of sensation." This probably represents a realization of the ultimate character of the meaning side.

Miss Washburn's doctrine,[63] on the other hand, appears to leave no room for any structuralistic difference underlying the cognitive distinction. She says that "recognition is an unanalyzable fact." "That by which the face seen today differs from the face seen for the first time, is something wholly sui generis." This fact has, however, hypothetically a correlate in the fact of central excitation. "By whatever process we imagine one brain center to excite another, the conscious accompaniment of the central excitation is the consciousness of familiarity, of knowness." A sudden sense of having been in a place before, without being able to recall the circumstances, is viewed as the consciousness arising from a process of central excitation, of the passage of a nerve current from one center to another, which is checked before it is completed. In the case of the recognition of percepts, the central excitation which arises so to speak to meet the incoming currents, reinforces the peripheral excitation.

In taking up the theories of the imageless thought exponents and of those who are in more or less sympathy with them, we note Miss Calkins' doctrine of relational elements. As is well known Miss Calkins has long contended for this third group of elements which are just as irreducible bits of conscious content as any of the abstractions of the structuralistic type of analysis. While admitting that organic sensations and a feeling of pleasure

[62] *Grundzüge der Psych.*, I, 2nd ed., 1905, p. 432.
[63] *Phil. Rev.*, 1897, p. 267.

are truly elements in the recognitive reaction, she claims that there are in addition relational elements involved. These would include the consciousness of myself as persisting through changing experience, and of the object as identical with something past.[64] And these latter are irreducible to anything except meaning terms, I take it. We hardly need to go into much detail in regard to the theory of the Würzburg school, as it is well known. There have been two stages of development, that in which the Gedanke and conscious reference were regarded as needing no imaginal carriers, and that in which the presence of content is admitted, but any effectiveness on the part of such content in determining the meaning is denied. Bühler sums up the contention in the sentence "It is not too much to say that one can mean anything with anything."[65] E. Mayer, in agreement with Ach, adds his testimony, admitting that Bekanntheit is Bewusstheit der Beziehung. He furthermore contends that "Reproductionen nur ein Begleitender Umstand des Weidererkennens sind."[66] And Watt is of the same opinion. "Doch darf jede theorie Reproductionen und sonstige Prozesse nur als Begleitererschsinungen der Wiedererkennen auffassen, den es muss noch betont werden, dass keine denkbare Gesetzmässigkeiten unter der Vorgängen beim Wiedererkennen je den Bewustseinsinhalt Wiedererkennung Erklären werden oder können. Denn das Bewustsein dass ich wiedererkenne ist immer etwas ausser den ihr zu Grunde liegenden oder sie begleidenden Vorgängen. Wiedererkennen ist als Bewusstseininhalt ebenso primär und unerklarbar wie Rot oder Lust."[67]

In the case of Bühler the doctrine is perfectly clear. There is no sort of a specific content which necessarily mediates the consciousness of old or of new. The others are more ambiguous. When Watt says that no laws of "Vorgängen beim Wiedererkennen" can ever explain recognition, this may mean that the cognitive distinction as such cannot be explained on that basis,

[64] *First Book in Psychology*, 1910, p. 127.
[65] *Arch. f. d. Ges. Psych.*, IX, 1907, p. 362.
[66] *Untersuchungen z. Psych. u. Phil.*, I, 3.
[67] *Arch. f. d. Ges. Psych.*, 1906, VII, (Literaturber.), p. 25.

or it may mean that there is no structuralistic or content mediation. There is no experimental evidence drawn from work on the perceptual level which is directly, as a whole, favorable to this hypothesis of unmediated reference. On the other hand, all experimenters report cases in which no mediating content was observed. Many of them seek to get around the difficulty by having recourse to the subconscious. There remain, in spite of this rather mythical attempt, instances which are undoubtedly stubborn, and refuse to submit to analysis with any of the concepts so far employed.

d. *Conclusion in View of Extant Experimental Results.*

In conclusion, we may say that the whole trend of the discussion and experimentation has tended to establish the following points:—

1. The evidence is fairly conclusive that recognition is not exclusively the result of the comparison with a revived image of the same content. Still Lehmann, Katzaroff, etc., report instances where this occurs.

2. The evidence seems to prove that associations are by no means essential to recognition, although there are many cases where they are the mediating content. Gamble and Calkins, and Katzaroff, by citing instances where judgments of old do not result even when associations are present, and others where judgments of novelty and reproduced ideas coincide, make it plain that with some subjects at least, the mere appearance of the latter is not the carrier of the past reference. The correlation is not thorough-going enough. The possibility of some further differentiation remains.

3. There is much evidence in favor of a feeling of familiarity which functions in a goodly proportion of the recognitions. On the other hand, we find that even the most ardent supporters of the doctrine cannot isolate the tonus every time. No unanimity exists as to whether this feeling is an ultimate datum of consciousness or can be further analysed. In the latter connection, the evidence as to the universal presence of organic sensations and an affective tone does not all tend in the same direction.

4. All experimenters cite cases in which no peculiarity of content can be shown to be present. A mere judgment of "known" or "unknown" is the sum total of the reaction. These results can be interpreted in two ways. On the one hand, we may have truly unmediated reference, a phenomenon which would agree with the tenets of the imageless thought school. On the other hand, and this is highly probable, the subject may not have been aware of the content distinction to which he was reacting. The general technique employed renders the latter view attractive. Either there has been an effort made to work out the situation in terms of one (or a very few) concepts, or the subject has been left to himself to isolate what he could in describing the experience. In either case, in the first owing to the limited number of categories, in the second owing to the failure of the subject to note highly habitual and hence less striking aspects, the real criteria may be overlooked. The hypothesis that the latter difficulty lies at the basis of much of the imageless thought reported is tempting.

5. There is one final point which has not been noted before that should be called to the attention at this place. Strong and Meumann both found that there seems to be an increase in the skill and accuracy with which the subjects employ peculiarities of old and new content in isolating the latter, as practice progresses. This is a highly significant fact and we shall revert to it later.

6. There are a few quantitative results which are of interest in this connection. Katzaroff reports the results of timing the judgments, finding that sure judgments are returned more quickly than doubtful ones, and also that there is no difference in the speed of judgments of oldness or newness.

Strong[68] finds:—

(1) The per cent of absolutely sure and correct judgments decreases very rapidly at first, and then more gradually as the interval between exposure and identification is lengthened.

(2) As the interval increases, the certainty of the recognition made steadily decreases.

[68] *Psych. Review*, XX, 1913, p. 1.

(3) Cases of incorrect recognition (a new stimulus judged old) are relatively rare as compared to the total number of correct judgments. Nor does the percentage materially increase as the interval increases.

(2) Theories of Ideational Recognition

So far we have been discussing theories which are concerned primarily with perceptual recognition, *i.e.*, recognition of objects present to sense. The subject of the difference between memory and imagination is one that has recently come to be of great interest. Waiving temporarily difficulties which may be involved in the statement, we shall take as a working definition the formula that memory images are those which represent or are referred to past sensory experiences as their antecedents, while images of imagination are those which have no such past reference. It is to be noted that with very few exceptions psychologists have considered the problem of recognition on the perceptual level as entirely distinct from that of recognition in the ideational realm. They have accordingly dealt with the questions separately and have set up hypotheses of a different type to explain the two phenomena. James is an exception to this rule. While not dealing with the matter explicitly, he shows by the whole trend of his teaching that he considers that the only differences involved is that in the one case the focal element or the content concerning which the judgment is returned is a percept, while in the latter case it is an image. Angell, Titchener, and Höffding are others who find the distinction to be one of the focal element and not of the actual processes involved. With these exceptions, the overwhelming tendency is to look upon the two processes as entirely separate and distinct.

Hume early laid down lines of differentiation that have persisted to the present time. He said that memory images retain the spatial and temporal order of the generating percepts, while images of the imagination have no such relation to past experience. Also, memory images are the more vivid.[69] The

[69] Treatise, Bk. I, Prt. I, §III (Selby-Bigge), p. 8.

former distinction is of course logical, telling us nothing of the actual processes involved; the latter is matter for investigation. The doctrine continued to be formulated in logical terms for a long time. For Bain[70] and Sully[71] the great point of difference is that memory revives a copy of the past, while in imagination we have a regrouping of elements. Bain in addition declares that in the latter there is always involved an activity of the will. We have already discussed James' theory of memory. The only distinction for him would be that the focal process is an image and not a percept. Höffding says that we have unaltered *vs.* altered grouping of elements as the basis of differentiation. Memory images are, however, recognized, a process which is the same on the ideational and perceptual levels.[72] Angell[73] is another author who believes that the recognitive reaction distinguishes memory from imagination images.

Jodl[74] sees in imagination the faculty of producing composite images through the addition of elements which did not belong to them originally, but which are easily associated with them. This adding may be the result of unconscious forces or it may be done consciously, as in the case of lying. Lipps,[75] while far from explicit in his doctrine in this matter, would, I believe, base his distinction on his doctrine of dispositions. A disposition might be defined as the tendency possessed by any content, which has once been present in consciousness, to reassert itself under appropriate conditions. Such dispositions may be considered as overlapping in so far as the content that they represent is similar. For instance, the dispositions of two tones of the same pitch and intensity but of different clang color, overlap in their common elements. Dispositions have, then, different "Seiten" or "Eigentümlichkeiten," which are capable of receiving a given "Bestimmung." In our illustration, we would say that the fact that all

[70] *L. C.*, p. 571 ff.
[71] *L. C.*, I, p. 362.
[72] *L. C.*
[73] *L. C.*, p. 225.
[74] *L. C.*, II, p. 162.
[75] *L. C.*, pp. 77, 83.

tones have some pitch represents one of the "sides" of its disposition, while any specic pitch would be the particular Bestimmung of that side. In so far, then, as different dispositions have the same "sides," the different specific "Bestimmungen" that they have exhibited are capable of being transferred from one to the other, even though such a complex has never been experienced in the perceptual realm. That is, if I should transfer the clang color of one tone of a certain pitch and intensity to another tone of the same pitch and intensity, but of different clang color, the second note may be conceived of as being qualified by an altered Bestimmung on a "side" which it possesses in common with the first, namely, the tendency to have some sort of clang color. This is, of course, a purely logical formulation. In another place, Lipps speaks of imagination as the capacity to arrive at results from premises without the necessity of traversing intermediate steps.

Baldwin[76] believes the recognition of an image to consist in the reinstatement of its apperceptive relations. The doctrine has already been discussed. Wundt[77] differentiates memory from mere renewal of content. In memory proper, we have the image recognized and brought into relation with the rather permanent ideas and feelings which constitute the nucleus of the consciousness of self. We also have a relatively exact representation of earlier experience. In imagination, there is a change in the arrangement of the Vorstellungen. As this also takes place to some extent in memory, the real differentium lies in the fact that in cases of the latter we have a free and untrammeled run of images mutually connected in accordance with the laws of association, while in the case of imagination, the connections established always involve a guiding purpose and an activity of the will, be it ever so rudimentary.

Külpe,[78] representing the Würzburg school, can find no difference whatsoever as far as the content and modes of psychic functioning are concerned. He says, "No mental process is in-

[76] *Senses and Intellect*, p. 176.
[77] *L. C.*, III, p. 631.
[78] *L. C.*, p. 188.

trinsically a recollection or an imagination; no special class of sensations has the exclusive privilege of subserving memory. A certain content becomes recollection by a judgment connected with it, and this judgment can be produced by extremely different causes. Imagination, in the same way, is characterized not by the appearance of particular series of sensations or ideas, but by the realization that the given ideas represent something new, never before experienced in this form, but possibly to be perceived in the future." Still Külpe seems to believe that the memory image resembles an earlier experience as regards quality and temporal and spatial disposition, while an imagination image does not. The difference is not, however, indicated by any immediate peculiarities of content.

Titchener[79] recognizes explicitly that the only difference between recognition on the perceptual and on the ideational level is that the focal process, the process remembered, is in the one case a perception and in the other an idea. He goes on further, however, to give a description of certain structuralistic differences between the two types of images which is based on Perky's work.[80] This is the first experimental research in this line that has come to our attention. Spoken words were used as stimuli, the observers being instructed to give themselves up to the visual imagery evoked, allowing it free rein. As a result of the introspection, Perky distinguishes sharply two different types of images, (1) on the one hand, images of recognized and particular things, figuring in a particular spatial context on a particular occasion and with a definite personal reference, and (2) images with no determination of context, occasion or personal reference (imagination image). The following differentia were noted.

1. In the great majority of cases memory images involve gross movement of the sense organ with which they are correlated, while images of imagination entail steady fixation.

2. Images of the imagination involve a mood of surprise, images of memory a mood of recognition or familiarity.

[79] *L. C.*, p. 413, ff.

[80] *Am. Jour. of Psych.*, XXI, 1910, p. 422.

3. Imagination images are substantial, complete and often highly colored, while memory images are scrappy, fleeting and filmy, sometimes spoken of as colorless etchings.

4. Memory implies imitative movement and correlated organic sensations, while with imagination we have kinaesthetic and organic empathy.

5. Images of imagination arise more quickly, more suddenly, and more as wholes, and persist longer and are less changeable than are the images of memory.

6. Memory implies roving attention and a mass of associative material, while imagination involves concentrated attention with inhibition of associates.

The next experimental work that appeared was that by Martin.[81] The subjects were instructed to project visual images of the two types side by side. It is difficult to see just how far the distinction between memory and imagination used by this experimenter is comparable to that of Perky. One of the main sources of confusion was that her subjects were allowed to frame their own definitions, *i.e.,* they received instructions to arouse images of these two kinds, but were furnished with no working basis of differentiation. In general it seems, though, that the basis for differentiation was that memory images were recognized as representing an earlier experience. In a footnote, Martin says that recognition was probably the most decisive factor. Even this, however, leaves doubt as to just how far her criteria are comparable with those of Perky, and, as a result, how relevant her criticisms of the latter may be considered to be. At any rate, she was able to substantiate none of Perky's results, and finds only two possible points of distinction.

1. The memory image generally comes first.

2. The memory image is generally accompanied by more associates and Nebenvorstellungen.

Ogden[82] has recently reported experiments along the same line. The criterion of differentiation used was that of familiarity. Again it is a question as to how far this allows his re-

[81] *Zeit. f. Phys. u. Psych.,* 61, 1912, p. 321.

[82] *Am. J. of Psych.,* XX, 1913.

sults to be considered as comparable with those of Perky. Familiarity, on further logical analysis, may have a number of degrees of connotation. It may, for instance, mean merely the awareness that I have experienced the object at some earlier time. In this case, the definite reference to a particular time and place utilized by Perky would be lacking, and it is doubtful whether results based on such divergent series can in any way be considered as comparable to one another. Working with words as stimuli, Ogden obtained results which substantiate those of Perky in one particular only, namely that memory images tend to be located at a distance, while imagination images are in near-by space. He finds in addition two differences:

1. In contradiction to the relationship established by Perky, the memory images are found to be distinct in a larger number of instances than are the imagination images.

2. The average reaction time for the memory images is noticeably less than for the imagination images.

From these results, Ogden concludes that the experimental criteria established do not afford adequate grounds for a differentiation of memory and imagination in terms of content. He believes that the differences are really matters of meaning, which are not "capable of complete reduction, either to certain characteristic and invariable sensory and imaginal attributes, or to a certain contextual setting, which may in turn be analyzed into terms of sensory and imaginal content." In addition, Ogden reports that there were many cases where a feeling of familiarity could not be found to be an accompaniment of the memory image. "Very often the observer reported an image as familiar or strange, but could detect no feeling attached to the experience." Although he mentions cases where associated images and ideas are the basis for the judgment, the general evidence of his own work seems to Ogden to substantiate the doctrine set forth by Külpe, which we have already quoted, to the effect that an image becomes a recollection through a judgment connected with it, not in virtue of any peculiarities of content. And the same is true of constructs of the imagination.

Koffka[83] reaches the same conclusion as the result of his work. He rejects Perky's criterion of personal reference and divides the images found, not into the classes of images of imagination and images of memory, but into general and particular images. The latter represent individual objects, the former do not refer to any specific object or event. His results are, therefore, not germane to the general problem in hand. It is of interest to note, however, that he also can find no differentia within the structuralistic content.

In conclusion then, we may say that the experimental work so far done has led to no unanimity of opinion. This is, we believe, largely due to the fact that the basis of distinction employed has not been the same in any two cases.

[83] *Über die Vorstellungen und ihre Gesetze,* 1912.

II. THEORETICAL DISCUSSION CONCERNING LOGICAL ASPECTS OF THE PROBLEM OF RECOGNITION AND CONSEQUENT ASSUMPTIONS RELATIVE TO EXPERIMENTAL TECHNIQUE

In view of the great diversity of theories that have been advanced and of the lack of agreement among experimenters, it is evident that a thorough investigation of the whole subject of recognition is requisite. This is the aim of the present monograph. Before setting forth the results of the experiments performed however, we desire to call the reader's attention to certain very significant conclusions that are called forth by a logical analysis of already established facts.

1. Except in the few cases already indicated, authors have very generally taken for granted that there are two problems of recognition that must be treated separately,—that of perceptual and that of ideational recognition. The mode of treatment has certainly been (although the fact usually is not explicitly stated) to regard these two forms of recognition as two absolutely distinct phenomena,—as different as are sensations and affective elements. Külpe will serve as a good illustration of this practice. He attributes the recognition of a perceptual object to the presence of a peculiar mood, while, on the other hand, he attributes the recognitive element in memory images to a judgment connected with them. He thus has one explanation for recognition in perception and a totally different one for recognition in the case of memory images.

This general assumption that recognition in the case of perception is one phenomenon and that in the case of memory it is a totally different phenomenon requiring a different mode of explanation, seems untenable. Because the content recognized in the one instance is different from what it is in the other, it does not at all follow that the processes of recognition are different in principle. On the contrary, as the experiments to be reported will show, recognition must be regarded as the same

in principle regardless of whether the content recognized is perceptual or ideational. Whether a perceptual object is old or new may be decided by an observer by means of an ideational criterion like the stability of its image; or it may be decided by him through a sensory test, such as the presence of motor phenomena. In like manner, an observer may distinguish between a memory and an imaginary object, either through sensory or imaginal processes. For instance, he may recognize a recalled date either by ease of articulation or by some characteristic of its visual image. There is, therefore, no difference in kind between the types of content that may serve as criteria of oldness or newness in the case of perceptual and ideational objects. Both perceptual and ideational recognition may thus be mediated on either a sensory or imaginal level; the mediating process may be the same in both cases, the difference consisting wholly in the kind of object recognized. It is absolutely impossible to say on *a priori* grounds in any particular instance whether the judgment will be due to sensory or imaginal factors. This will vary from individual to individual, and for the same individual at different times and in different experiments.

2. Again it is clear that the majority of theorists have considered that we have recognition in memory, or, in the perceptual sphere, when we are conscious that we have experienced an object before, while in all other cases it is lacking. Take Höffding and Angell. For the former, it is the presence of revived images that constitutes recognition and lack of them that accounts for its absence. The latter seems to believe that recognition marks off memory from the reproductive imagination. The distinguishing mark is the presence of something in the one instance that is lacking in the other.

Further analysis convinced us that this view is erroneous. Recognition is present in both memory and imagination, both with objects judged old and with those judged new. We recognize a hat as one we have seen, or we recognize a machine as something foreign to our past. It is a matter of what is recognized, not of the presence or absence of some given factor or process. In fact the whole point is well brought out by saying

that recognition is merely a specific form of cognition. When we are conscious of oldness we are re-cognizing, cognizing a content as having been perceived before, while when we judge something to be new, we are cognizing or thinking it as foreign to earlier experience. The presence of a definite meaning is obvious in both cases. The difference is in the specific conscious qualification or Auffassung concerned, not in the presence or absence of some psychological process. Moreover, these judgments of oldnesss or of newness are merely special cognitive reactions, in every way on a par with the awareness of presence or absence, kind, difference, likeness, quality, etc. As I may cognitively react to objects as trees or as animals, as big or as little, as similar or as different, so I may react to them as old or as new. This does not signify that there are no differences of content in evidence when diverse judgments are returned. There are objective differences between the tree and the animal which parallel the differences in the concepts applied. Just so there are (presumably) differences in the content present when judgments of old or of new are returned. The point is that we do not have these differences plus a unique type of reaction, unlike any other processes encountered in the realm of psychology, but these differences plus a meaning distinction which is on a par with numberless other meaning distinctions.

3. In recognizing objects as old or as new, we are always judging concerning fixed definite relations between certain terms. In memory we never remember an isolated object, such as a tree, but always *something about* that object. The object of memory can always be expanded into a declarative sentence, with subject and predicate terms. We remember that the *tree* was *large,* or tall, or green, or in the corner of the yard, or was a tree which we saw. There are always specific relations between terms. These may be of various kinds. In our illustrations they are those of magnitude, quality, spatial position, of subject and object. In like manner, in imagination we are always concerned with the *alteration* of some specific relation or group of relations. When I conjure up the image of a winged dog, only the juxtaposition of the dog's body and of wings is new, not

the terms themselves. The same holds true in perception. When I recognize my hat, it is always some specific relation or relations which constitute it an old object. It may be the spatial, quantitative, and qualitative relationships of a broad brim, a high crown, a narrow ribbon of a particular hue and material. The doctrine at present current in psychology that all imagination consists in the novelty of combination of old elements is evidence in favor of the truth of this contention. The terms as such are never the basis of the decision, a strange hat is made up of familiar components. What makes this actual difference between my old hat and the new one of my friend is that the one embodies certain relations that the other does not. Owing to this, I judge that the one object is familiar, the other not.

That this doctrine is valid is seen by the fact that where no specific relations are involved, we never cognize the object as old or as new. We have rather on the ideational level the general idea or conception, and on the perceptual level the mere consciousness of the class. I abstract from any specific relation and merely concern myself with certain large general relations between terms. I think of a dog; this would be a general idea. Now in contrast to this general idea, suppose that I recall that a specific dog of my acquaintance is small and white, or suppose I imagine that a dog has wings. In case of the general idea I merely thought of a four-footed animal with a certain body structure, etc. The process of rendering one or more of these relations specific effects the transition from a general idea to a memory on the one hand and the process of altering one or more of these relations would change the general idea into an imagination product on the other.

Likewise in perception. The difference between a hat, my hat, and a strange hat is the difference between confining the attention to certain omnipresent relations peculiar to the class and neglecting the individual manifestations in the existing instance, and isolating certain specific relations which constitute the object either a familar or a strange member of the class. It will be understood that we are in this section discussing the concrete meanings in these different cases, the *what* I am con-

scious of, and are neglecting for the moment, the peculiarities of *content,* if any, which bring it about that these different phases are cognized. We reiterate, then, in conclusion, that in memory, imagination, and perceptual familiarity or strangenesss, the actual object involved is always a unitary complex whole consisting of differentiated parts and attributes standing in specific relations to each other and that novelty or oldness refers to the relations involved.

It follows then, that any complex whole may consist of a larger number of parts united in many relations, some of which are new and some old. The proportion between the two kinds may vary for different objects. In fact, in any concrete case, we are always dealing with a situation in which these aspects of novelty and of oldness co-exist. Any judgment returned is then always relevant to some limited number of relations. The same content may be judged old and rightly so if one particular phase is singled out, or new with equal correctness, if another is isolated. Thus, if I am asked whether I have ever seen a certain book, my answer would be entirely different according as I interpreted the question. If I understood the interrogator to be interested in determining whether I had ever seen a certain combination of a number of leaves of a certain size, a cover of a certain hue, and words with certain definite meanings on the outside, I might answer "yes." If, on the other hand, I understood him to be interested in whether I had ever seen these elements on a certain desk at a certain hour of the day with a certain arrangement of light and shadow, I might say "no." The subject himself may not be aware of this analytic and abstracting activity, may in fact not know what particular relation is the object of his estimate, may not know in other words, what relation *is the object* for him. But the selective activity of attention guided by the dominant interest of the moment or by other factors which stress particular aspects of the total datum, will always insure the specific reference of any particular judgment. This inability of the subject to point out what he is actually reacting to is well illustrated by such instances as where the sailor feels that the boat is not riding correctly, though he

cannot tell why, and the case reported by Whipple where a subject thought that he was reacting to pitch but was really influenced by the time elapsed. The fact is also notorious in the motor reactions to percepts.

It may occur to the reader at this point to object that the idea of a giant is usually spoken of as an imaginary idea, and that this is not the idea of a complex in which certain concrete relations have been changed. The whole structure seems novel. In reply it may be pointed out that there is a fallacy involved in his objection. Such ideas are in the great majority of cases either conceptual or memorial, usually the former. They refer to past ideas or pictures, etc. In so far as there are no specific relations singled out and rendered concrete objects of memory, they are general in their reference. If we have not actually seen pictures of giants we have at some time built up an ideational complex step by step by bringing terms into new relations. We really at that time imagined the object. But the child of the constructive imagination, constructed yesterday, becomes memory today if we remember specific relationships established on the former occasion, or conception if the relations are more general. We must then be exceedingly wary of employing as a means of getting imagination products, words which refer to or mean objects that, once imaginary ideas, have become memories or conceptual objects. Such general ideas of imaginary products or such memory ideas of past imaginings, are what Ogden's stimuli are adapted to bring out. And in so far it is a question if his actual results are relevant to his problem.

The implications of this analysis for experimental technique are significant. If the subject is practically always confronted with a complex which embodies some old and some new relations, and if he is sometimes in the dark with regard to what particular aspect he is reacting to, we are forced to make the problem definite in experimenting. This may be accomplished by altering only one phase of the complex at a time, and then either indicating to the subject what this aspect is, or forcing him to return an explicit judgment concerning it, even though ignorant of the locus of the change. Any other procedure leaves

us with results which are incomparable *inter se.* Take for example the woman's hat and the book which Martin asked her subjects to image, and consider the following hypothetical description of what our analysis leads us to believe often took place in the course of her uncontrolled work. In both cases, it may have occurred that while the colors imaged were those of the past concrete experiences, the relative size of different parts of the complex image was abnormal. The subject judging concerning the quality in the case of the hat may have classified the image as a memory product, while the abnormal proportions of the book led to its being regarded as an imagination image. As he is often unable to specify correctly the phase reacted to, the subject may have had his attention drawn in both instances to the unaltered relation under the impression that this was the efficient aspect. As a consequence, he would naturally isolate the same peculiarities of content with both objects. We would have then, different judgments, the same content, and no difference discovered between memory and imagination images. This is a probable explanation of Martin's results. In other words some of her objects were ambiguous, and might be correctly judged either as products of the imagination or of memory, according to the particular aspect of the whole which engaged the subject's attention.

Where, however, there is only one relation altered at a time and this is either specified to the subject or he is forced to judge explicitly concerning it (*vide* our unknown series), this relation will be the object reacted to in the majority of cases and in all cases the peculiarities of content involved in cognizing it will be the center of attention. There is, of course, even here a chance that while attending to the specific relation the subject is reacting to another aspect. In as much, though, as there is only one relation altered, the judgments of novelty, since they are in the great majority of cases correct, *i.e.,* occur with altered content, must be relevant to this relation. Again, since the majority of old judgments occur with unaltered content, the same thing must be true for them. While on account of the complexity of the situation, we can never be absolutely certain that the speci-

fied relation will be the one reacted to, the fact that there is always a high degree of correlation between the judgments and the status of this particular aspect, indicates that calling the attention of the subject to a phase of the total situation prior to the presentation will insure its being the point of estimate. By virtue of the fact that the attention of the subject is concentrated on this point, whatever peculiarities of content are present with the different judgments should then be brought out clearly in the reports. The subject himself may not be able to isolate the differences. The experimenter will, however, be able on the basis of a large number of cases to establish a correlation between the meanings and content of particular types. The same result would be obtained even where the subject does not know what particular aspect is altered, provided he is forced to judge explicitly concerning all the crucial relations. In so doing his attention is directed to each one in turn, and the content that accompanies the awareness of any aspect is thrown into relief. We can, then, see whether there is any peculiarity of this content present when judgments of old or of new are returned.

So far in our analysis we have been abstracting from one relation which is always involved in recognition of oldness. It is not merely a question of whether a specific relation among terms is old, but whether it is old for me. This *personal reference* is present in every cognition of oldness or of novelty, either implicitly or explicitly. It is generally implicit. If I judge a certain combination of colors to be repeated, I often record my decision with such sentences as, "That is old," or "I know that," in which no overt indication of *my* earlier experience is contained. But these modes of expression always point to such an earlier experience or to the subject's past as one of the terms essentially concerned. For to be old, means to be old for the person judging, to be known, means to be known as a result of earlier contact, and to be habitual means to be habitual for the subject. On occasion this personal or perceptive relationship is explicitly indicated. The subject says "I saw that red house before." Here, as is generally true, we have another

relation (house-redness) besides that of the personal experience. In a few cases, this second or objective relation is altogether lacking, and the personal reference only appears. The judgments are always what we may perhaps call sensational, *i.e.*, the objective content is so reduced as the result of abstraction that the subject merely considers some sense quality, or other highly abstract phase of the presented field in the relation to his past experiences. The decisions take the form "I smelled that before," "I recognize that taste," "I saw that green," etc.

4. It follows from the above discussion that any old relationship between terms is to some degree habitual, while novelty of combination violates habit. We believed then that this difference might afford us a clue to a possible line of demarcation. This difference would, of course, be one of degree. There may be old relations which are not thoroughly habitual, as they may not have been experienced often enough, while there are new ones which do not violate habit very greatly.

5. Habit has always been an important category in psychology, but in application it has generally carried a physiological connotation. *A priori* this appears to be a detrimental limitation of a highly useful conception. Effects of the reinstatement or the violation of customary relations of terms or other conscious content should be clearly observable on the psychological side. From a physiological viewpoint we speak of an habitual reaction as quick, easy, with all the various component movements linked into a series marked by smoothness and facility of sequence, susceptible of repetition and prolongation in a more or less unaltered manner, and apply contrary conceptions to non-habitual responses. So likewise, we anticipated that wherever the subject was face to face with a situation calling for reflective manipulation and characterized by habitual or non-habitual relations, a series of similar descriptive terms would be found to apply to the conscious processes involved.

A truly psychological connotation for the term habit can be found, if we are correct in our surmises. Nor are we limited in the sphere in which we may search for habit manifestations. Any phase of the content may show these habit characteristics.

Differences of intensity, ease of arousal or of maintenance, stability, permanence, immediacy of appearance or delay, any of these and other aspects could embody the workings of the principle of habit and serve as a basis for differentiating the novel and the old. The aim of our experiments was to test this hypothesis.

6. Logical analysis allowed us to reach these formulations of the nature of the problem involved in recognition and to anticipate the probable line of solution. With this as a background, we made certain important assumptions which influenced our experimental procedure, and which our researches were designed to test. In the first place we assumed that all logical distinctions, (of meaning) are paralleled by a corresponding series of psychological or content distinctions. This means that, in this case, we believed there are certain peculiarities of content which can be shown to be present with a judgment of oldness and to be lacking with a judgment of novelty, and vice versa. The business of mind in its cognitive phase is to secure logical distinctions. This is thought regarded from the functional point of view. One of the main tasks of psychology is, we believe, to explain if possible how the mind is enabled to draw these cognitive distinctions, *i.e.,* how the mind functions. We assume in our hypothesis, that these thought differentiations are made in view of certain peculiarities of content. This means that structural and functional psychology would parallel each other, and that the structural distinctions are the means employed by the latter in explaining its phenomena. Content and meaning would stand in the relation of cause and effect. We would thus have a causal explanation of certain mental phenomena in purely conscious terms, with no need to appeal to physiological hypotheses for our immediate means of elucidation.

In opposition to such a theory as we have just outlined, stands the whole doctrine of those who advocate contentless thought. In their view it is true that the mind cannot make distinctions without the presence of any content whatsoever, but the content which is observable is not relevant to the judgment rendered, *i.e.,* does not mediate the reference. Structure and function are in-

dependent variables in the sense that they are not found to vary concomitantly, they manifest no intrinsic relation. The quotation from Bühler in the historical part of this paper brings out the distinction admirably.

The hypothesis put forward does not assume that the parallelism is necessarily between some kind of specific meaning and a peculiar *qualitative* distinction in the content, as is usually done. We assume rather that any phase of the content or of any complex of contents may serve to mediate the cognitive reaction. The relation between structure and meaning is a special phase of the stimulus and response situation, and any aspect of content which can stimulate a specific motor or verbal response may likewise carry a specific meaning. In our work then we are not limited merely to attributes of elemental artifacts nor to qualitative distinctions. In fact in perceptual experience, any of the following may be the stimulating aspect reacted to: Quality, as when I name various colors differently; Size, as when I select nails of different sizes in doing a piece of carpenter work; Form, as when I differentiate between a circle and a square; Position, as when I vary my reaction to a street car according to whether it is a block away or very near me; Intensity, as when the hunter prepares to shoot as the noise made by the approaching animal becomes very loud; Behavior, as when a tennis player uses different strokes according to the way the ball bounds; Context or the presence of associated materials as when a fire in the grate incites a very different reaction from a fire on a rug. It is of course obvious that any specific combination of these factors may be reacted to. Diverse motor and verbal reactions to objects which differ in any of the aspects named are thus seen to occur in actual life. We believe the same to be true in the case of all thought distinctions, *i.e.*, that different meanings are mediated by contents which differ among themselves in regard to any of the characteristics mentioned.

This whole assumption regarding the parallelism of thought and content is to be tested by the course of the work undertaken herewith. The vital point at this juncture is to note that we start out believing that there is no valid reason for limiting the types of criteria sought.

Although we believed the cognition of oldness or of novelty to be mediated by specific content distinctions, it does not follow that the subject must therefore be aware of this fact. There may be several degrees in the subject's ignorance: (1) The subject may be unaware of the bare fact of mediation itself. This result will be found to occur most frequently in perceptual recognition, where the object is immediately classified as new or as old, and where there is no sense of any dependent relation between the judgment and the content. The judgment is there, given, and defies further analysis. (2) The subject may be convinced that his judgment was mediated by some phase of the content, but be absolutely unable to point out the specific determining factor. (3) Lastly the subject may not only be conscious of the mediated character of the decision, but he may also attribute it to a certain definite characteristic of the content. This does not imply that he is by any means necessarily correct in the latter phase of his judgment. He may report with a high degree of certainty that his judgment of novelty was based upon the instability of a visual image, and yet be wrong. This error in isolating the efficient element of content would not necessarily entail an error in his judgment regarding the oldness or novelty of the situation. The correlative judgment may be wrong while the latter is correct.

Two very important negative propositions concerning experimental procedure follow from the above assumptions: (1) All upholders of the doctrine of the non-mediated character of the recognitive reaction rely wholly upon negative introspective evidence. All experimenters have reported many cases in which correct judgments of oldness or of newness were returned, and yet the *observer* was unable to detect a content basis for the judgment. This absence of any *sense* of mediation leads to the conclusion that mediation was not present, a doctrine based solely, as we have already indicated, on the negative fact that the subject could not detect the circumstances unaided. The only proof of the non-mediation doctrine that is offered lies precisely in these negative statements, a line of argument the validity of which we deny.

(2) When mediation is felt to be present, experimenters, in dealing with the problem of the particular content basis of the mediation, have habitually relied upon the subject's introspective analysis of the correlation. We, on the other hand, shall give reasons for doubting that these reports are necessarily valid. That they are generally correct must be admitted, but they are on occasion subject to grievous error, and hence conclusions based on introspective reports alone, unchecked by other means (the usual manner of experimenting to date) may be misleading.

Our technique is characterized by the objective comparison of two sets of data in the attempt to establish a correlation by the method of concomitant variation. The subject (1) reports his decision concerning the oldness or newness of the stimulus and (2) describes in all possible ways all the content phases present during the total experience. After taking a large number of such reports, the experimenter (not the subject) attempts a correlation between a specific judgment and different aspects of the content. If a judgment of novelty is present whenever instability of the visual image is reported, while judgments of oldness accompany stable images, we conclude that a causal relation exists, that mediation is based upon the stability aspect of the image. This is the only and final test of the theory of mediation—of a causal dependence of meaning upon content—that of invariable concomitance.

That mediation, causal relation or *invariable* concomitance between meaning and content can exist without the subject's immediate awareness of the fact, is evident on a moment's reflection to one conversant with scientific modes of procedure. In any science, such as chemistry, a result is observed along with a great mass of concomitant phenomena, among which the scientist knows the cause of the occurrence is to be found. But at the moment and without further manipulation the investigator is at sea as to the particular phase of the total situation which is the cause in question. In order to isolate the latter, he may either vary the totality of the phenomena before his eyes until the sequence of cause and effect is immediately observed, or he may record the events and compare this record with a large num-

ber of other instances where the effect was noted and thus determine the common antecedent present in all of them. The same situation confronts the introspecting subject. He reports a result—a judgment, of novelty or oldness,—and at the same time he observes a highly complex series of content processes. Why should a naïve observer be supposed to suspect a causal correlation between the meaning and content sides of his total reaction, let alone to determine the particular aspect of content involved?

In fact the subject can immediately suspect and observe a causal nexus or correlation between his judgment and the accompanying content processes only under special and unusual conditions. These include the following factors, a period of doubt and delay following the presentation of the stimulus, a series of variable processes on the content side in evidence during this period and an immediate judgment following a specific change in the content. Suppose for instance that the observer is in doubt as to whether the stimulus is old or new, and during the moments of hesitation, an associate train, a particular mood, a peculiar motor reaction, all come in without relieving the stress. Suddenly a visual image of the stimulus appears and right on its heels comes the judgment that the object is old. Here the chances are very great that the subject would believe that his decision was mediated by a very specific bit of content, the visual image. This might not be the actual basis of the reaction, but we would have here a definite sense of mediation. As we have said, the validity of this introspective correlation would have to be tested by more objective methods later.

On the other hand, suppose that during the initial period of doubt, a complex content composed of visual images, moods, associative trains, organic sensations were present, and that all were changing in various ways, or that a number of them put in their initial appearance at the same time. Suddenly the subject comes to a decision. As there were a number of aspects of the content in simultaneous change just prior to the solution of the difficulty, he may be sure that some of the variations were concerned in the result but necessarily is incapable of determining

which change was responsible. There is thus a sense of mediation, but no knowledge of what the actual basis of the reaction is. In the case of percepts having no ideational or central concomitant processes, the elements of content changes is lacking. Perceptual content is given, fixed, hard, and unyielding. Flux is characteristic of the central activities only. Therefore the sense of mediation must be lacking where only the perceptual content is present previous to the judgment. All that is in evidence is fixed sensory content plus meaning. It is precisely such cases which furnish the ammunition for the defenders of the theory of non-mediated reference. Our present analysis shows why mediation even though present would escape the subject under these conditions.

Under these conditions, mediation or causal nexus cannot be immediately sensed or observed, it can only be inferred from an objective or memory comparison of a large number of cases in which content variations have been introduced. If the subject then found a parallelism between his judgments and certain peculiarities of the percepts, he would be justified in tracing a causal connection between these two phases of the situation and in saying that the sensory peculiarities themselves mediated the judgment. In other words, the subject in order to establish the fact of mediation would have to resort to the technique employed by the present experimenter. We obtained a double report, as to meaning and as to accompanying content, and then on the basis of a large number of cases determined the correlations. We always received the subject's report as to the felt correlation, but these reports were taken as final only when they were verified by our objective results.

8. Also to bring out the factors involved we must use whereever possible, extreme cases, cases where the relations are strikingly old or strikingly new. That is, we shall take instances where the violation of the old system is very marked and where lack of alteration is equally notable. Moreover, in dealing with this material, we shall try, in the majority of experiments, to create a situation in which there is a high degree of doubt, where alternatives are present, where, in fact, the subject is forced to

reflect and call in all possible aid in order to reach a decision. This will tend to throw the peculiarities accompanying both meanings into relief, to make clear the fact of concomitant variation, and, especially where the subject is dealing with first a new and then an unaltered object, will emphasize the processes involved.

It is exactly here that many of the earlier experiments are defective. Take for instance the work of Bentley and that of Whipple. The latter's maximum interval between standard and test seems to have been 60 seconds, while the former never exceeded five minutes except in a very few cases. Moreover in both cases the subject in the second presentation knew what he was looking for, was all primed for his response, and when the stimulus came it fell right into a prepared groove. Abramowski's maximum interval was five seconds, etc. It was obvious that such procedure as this is not well calculated to bring out the factors involved. The stimulus is almost a part of the subject's present mental furniture, and there is practically no doubt. This will always lead to the overlooking of the mediating content. Where any action is too habitual and quick we experience great difficulty in observing what takes place. We shall see that in the following experiments this difficulty was avoided.

III. EXPERIMENTAL SERIES I, THE RECOGNIZED CONTENT BEING PERCEPTUALLY PRESENT

(1) General Technique

In working out a technique for experimentating on the problem we have been discussing, we were guided by four motives. They have already received some consideration in the preceding section.

1. We desired to observe recognition as it takes place under conditions which are adapted to bring out the essentials of the process and where the dependence of the subject upon peculiarities of content which we believed to exist would be most obvious, provided our hypothesis should prove tenable. Such a conditions is, as we have already said, to be found where there is doubt and a subsequent decision following on deliberation and thought. Further assistance was to be anticipated from studying the old and the new situations in contrast. Under these conditions, the chances of overlooking phases of the total situation which are the real bases for the reaction are reduced to a minimum and even where they are not indicated by the subject as being the efficient stimuli, a careful examination revealing their invariable presence when one decision and their invariable absence when the other is returned, will give us a means of establishing their true status.

2. In order that the latter result may be achieved and that the subject's own belief may not be the only basis we have for establishing the correlation between structure and function, we need a method that will ensure the direction of the attention to as many phases of the process as is feasible. By this we mean that introspection should be obtained on as many points as the subject feels himself able to report upon without falsification of results due to the fact that the experience is constantly retreating in time as the report proceeds. Moreover, in this way we can be sure that the different points are reported in every case and can thus know how far any result is typical and not a mere chance appearance.

3. We also desired to employ as many different kinds of material as possible, and to vary the particular changes of relation between elements used to give us our novel stimuli. This procedure was, of course, calculated to avoid generalizations based on isolated peculiarities. In this connection, however, it hardly needs to be mentioned that we did not employ meaningful material.

4. In order to control the factor actually reacted to, we altered but one specific relation at a time. In this way we avoided ambiguities and were sure that our results were comparable *inter se*. Moreover, this relation must be sufficiently simple and easily understood so that it can be pointed out to the subject when necessity requires. This will insure his turning his attention to the vital problem in hand, and neglecting other factors which might lead to confusion.

In order to realize these conditions, we adopted the following technique in our initial series of experiments. Six pairs of (1) nonsense syllables, (2) letters, (3) geometrical forms, (4) small squares of colored paper, (5) three-place numbers, were mounted on cards. On each card there was only one kind of material, *i.e.*, in no cases were nonsense syllables mixed with letters, etc. The pairs were placed, one below the other in such a way that they could be presented in temporal sequence. The exposure apparatus used was the drum commonly employed in memory experiments.

The pairs were presented one at a time, each presentation lasting five seconds. In this way the subject was given an opportunity to go through the series of six only once. There were no restrictions as to the method of learning except that the subject was not to seek associations. No effort was made, however, to prevent the appearance of such as spontaneously offered themselves.

After the subject had been given one series of six pairs, there was an interval of an hour. No restrictions were placed on the way this intervening time should be spent. As a matter of fact, the subjects generally spent it in study, working about the laboratory, etc. We thus approximate the conditions of ordinary

life. The instruction was, however, given not to recall the material and think about it during the interval.

We chose to use an interval of an hour as we had found by preliminary work that this period was well adapted to give us the condition of affairs that we desired, namely, a state of doubt in the case of a good proportion of the pairs, without at the same time rendering all intelligent judgment impossible, *i.e.*, placing the subject in a position where his decisions were little better than guesses. We had, in other words, a situation where the subjects were neither so sure as to be unable to note clearly the factors involved in the decision, nor so doubtful as to remove all real validity from their choice.

At the end of the hour the material was re-presented. The following changes were made:

1. The spatial order of the individuals in a given pair was changed, *i.e.*, if the pair had been x - y before, it was now given as y - x. This we called a change in order.

2. New pairs were made out of individuals which had not been together in the first presentation, *i.e.*, if we had two pairs, *a, b* and *c, d,* when the material was presented, we now had the pairs *a, d* and *c, b*. The individuals were always left on the side that they had been on in the initial series. We called such an alteration a change of arrangement.

3. New individuals were introduced. The new individual could be either the first or the last member of a pair or there might be a completely new pair interpolated. This was called a change of individuals.

Only one of these changes was made in any given series. If on re-presentation changes of order were introduced, no changes either of arrangement or of individuals were present. There were always three old pairs and three new pairs in every series, the places where they occurred being constantly varied. The subjects at no time had any knowledge of the number of changes made.

There were two methods of procedure, with and without knowledge. In the former case, the subject was told that only one change would be made in the re-presented series and was

also informed as to the exact nature of the change, *i.e.*, whether it would be a change of order, arrangement or individuals. In the procedure without knowledge the subject knew absolutely nothing except that changes of some kind could be expected in the second series. It is obvious that in the latter case there are three judgments involved in every decision, *i.e.*, the subject would have to decide about any given pair whether (1) he had seen the individuals, (2) he had seen them together, (3) he had seen them together in the same order.

With changes introduced as described above, the subject was given the re-presented series. Each pair was exposed for five seconds, unless of course the subject came to a decision before the end of that time, At the end of five seconds, the shutter was closed. The subject then reported his decision if he had made one, and if not was allowed to think the matter over, the stimulus being, of course, removed, until he either came to some conclusion or reported that decision was impossible. A number of times in the course of the experiment the material was exposed again for a few seconds at the request of the subject. This happened rarely, however. As far as our problem was concerned this second exposure made no difference whatever as we were interested in the introspective reports, not in the quantitative phases of the matter.

After the subject had indicated a decision, the following questions were suggested by the experimenter as a means to getting as complete a statement as possible of the processes involved in the reaction.

1. Are you sure of your decision, or are you in doubt?

2. What kind of imagery are you using?

3. Is the group present at once in the focus of consciousness, and do you decide on the basis of the group as a whole, or does the attention feel its way from one individual to the other? Does this involve a fading of the former into the fringe?

4. Do you try any other order or any other arrangement, (varying with the specific change indicated)? Do you work over this pair a number of times?

5. If you get the individuals in a temporal sequence, and not

as a unit, is there any noticeable ease or lack of ease in the way the second follows the first, *i.e.,* is the articulatory or auditory, etc., sequence noticeably smooth and spontaneous, or is there a readjustment, accompanied by hesitation, focusing of attention and a certain amount of volitional guidance necessary at the point of transition from one individual to the next? Is there any tendency to stop and reverse the sequence at any point?

7. Did any associations present themselves? If so, did they come immediately and spontaneously, or after an interval and as a result of conscious effort?

8. Do you note any peculiarity of mood?

9. Are you conscious of any movements and of any strain sensations?

10. Do you note the presence of organic sensations?

11. Is the process pleasant or unpleasant?

12. Do any clinching or rejecting movements appear?

13. How does your attention act? Do you glance at the material and drop it, turning your mind to other things, or is your attention held suspended, involving a continuation of the kinaesthetic factors present? Do you stop to look over details and try to see what ideas you can bring into connection with this content?

14. Did you have a visual image, either of this pair or of any other pairs or individuals? Was it good, clear cut and distinct? Did it come immediately? Was it relatively permanent or fleeting? Was it stable, *i.e.,* did it hold together in space, or was there any tendency toward disintegration.

15. Were there any logical reasons for your judgment, *i.e.,* belief that this pair in the natural course of events was likely to be changed, etc.?

16. Was your attention especially called to either individual, or was it equally divided between them?

Subjects. The persons serving as subjects in this experimental work were Doctors Hayes (H.), Fernald (Fe.), Vincent (V.), and Sutherland (S.); Messrs. Ferris (F.), Jones (J.), Perrin (P.), Beanblossom (B.), Carter (C.), Wylie (Wy.), Latham (L.), Bickel (Bi.), Johnson (Jo.), Kjerstadt (Kj.), graduate

students specializing in psychology; Misses Abbott (A.), Waterhouse (W.), Ford (Fo.), of whom the first two were graduate students, the latter an undergraduate who had had psychological training.

(2) Quantitative Results

We find that our quantitative results vary from individual to individual and also that the returns in the unknown series are different from those in the known.

Known Series. In computing the number of correct and incorrect judgments, we were confronted with a difficulty. It is perfectly obvious in the case of a change in order or of arrangement that there is only one possible unit and that is the pair. But in the case of the introduction of new individuals, we are dealing with a slightly different situation. There are two individuals in each pair, each of which must be the subject of a judgment. There are accordingly chances not only of assigning a pair containing a new member to the past in all its entirety, and of judging an old pair to contain a new member, but even where the subject judges that he is dealing with an altered situation he may be wrong about the locus of the alteration. He may judge an old individual to be new or a new individual to be old without affecting the validity of his judgment as far as the pair as a whole is concerned. If, for instance, in the case of a pair of two new individuals, the subject should declare one to be new but the other to have been present in the former series, we would, if we were dealing with the pair as a unit, have to count this as a correct judgment of novelty, inasmuch as there is no question that the pair is new. It is obvious, of course, that this would be representing but a part of the truth of the matter.

In order to avoid this difficulty, we adopted the following method of scoring. In the case of changes of order and of arrangement where there is really only one judgment involved in every case, we counted each pair as a unit. In the case of changing individuals, we used the same system where the pair was *correctly* accepted or rejected as a *whole,* since in this case also we have practically a total reaction. In cases where there were

two distinct judgments, *i.e.*, where each individual either did or should receive separate treatment, we counted the individuals as units. There may be some objections to this method, but it was the most feasible that suggested itself in view of the fact that we wished to compare the results of the known and unknown series. The latter introduced difficulties which would make any fair comparison impossible on any other system of scoring that suggested itself. We shall speak of this matter again in considering the unknown series.

TABLE I

Subject	*Possible*		*Old judged old*	*New judged new*
	Old	*New*		
B	21	26	80%	57%
J	9	8	67%	50%
F	31	35	77%	83%
Fe	11	12	91%	75%
H	11	13	100%	84%
Fo	16	21	62%	81%
P	12	18	92%	77%
W	17	23	82%	83%

TABLE II

Subject	*Total actual No. judgments of*		*Of these, correct*		*Percentage of all judgments correct*
	Old	*New*	*Old*	*New*	
B	28	19	60%	79%	67%
J	10	7	60%	57%	58%
F	30	36	80%	80%	80%
Fe	13	10	77%	90%	82%
H	13	11	84%	100%	92%
Fo	14	23	71%	74%	73%
P	15	15	73%	93%	83%
W	18	22	78%	86%	82%

The unequal number of judgments for the different subjects was due to the fact that not all of them worked with series containing all the different alterations. The unequal number of possible old and new judgments in the results of any one subject was due to the fact that in very few cases was the whole of the series of six pairs presented the second time. As the old and the new pairs were not arranged alternately, more of one kind than of the other were presented under these conditions.

Table I represents the relative chance of any content, old or new, being judged correctly. It answers the question, what likelihood is there that an old relation will be judged old as compared with the chances of a new relation's being judged new?

In Table II, on the other hand, we are interested in seeing what the chance is that any specific judgment which is rendered will be correct. The question here is, granted that I have returned an old judgment, how do the chances that it is correct compare with those of any given judgment of novelty? We note then the following:

1. Table I shows us that we are dealing with a matter which varied with the individual, and that no universal statement can be made. Five subjects (B., J., Fe., H., P.) were more likely to judge old content old than new, new; two (F., Fo.) were more likely to judge new content new than old, old; in the case of W. there is no difference. It is then obvious that in the majority of cases old content is more likely to be recognized and accepted as such, than new content is to be rejected.

2. Although the relative reliability of the judgments is also liable to individual fluctuations, still it is clear that wherever any difference exists, the new judgments are the more reliable (Table II). This is true in the case of five subjects (B., Fe., H., W., P.). With the other three subjects no difference is discernible. These results mean, of course, that many new units are erroneously accepted, while but few old objects are rejected. As we noted, the first table indicated that this was the general rule. This result fits in with the old statement that we tend in general to accept things that we have no reason to doubt. It should not be forgotten, however, that this is not absolutely universal, but that the factor of individual variability is always present.

(Unknown Series.)—Where the subject did not know what the alteration would be, the situation is slightly different. Under these conditions every pair raises three questions: (1) Are these the same individuals, (2) Were they together, (3) If so, were they in the same order? It is obvious that there are four possible judgments in regard to every group, one for each individual, one for the arrangement and one for the order. As a matter of fact, however, only a limited number of pairs ever have all the decisions made concerning them. If one of the individuals is rejected, there is nothing more to be said, as the other problems

are simply non-existent. In such cases then, the unit of judgment is really the individual. Where, however, the group is judged to be entirely old, the unit of judgment has been the individuals, but it has also been the group. In order to bring anything like a fair standard out of this, we shall adopt the following rule. Wherever the group is judged entirely old or entirely new, or where it was judged that there was an alteration of order or of arrangement, *provided these judgments did not overlook a difference in the true status of the individuals,* we shall consider the group as the unit. Where, however, there either was or should have been a difference made between the individuals of a group, one being judged old and the other new, we shall consider the individual to be the unit. It will be remembered that we adopted the same system of scoring in the case of the known series in anticipation of the present considerations.

TABLE III

Subject	*Possible*		*Old judged old*	*New judged new*
	Old	*New*		
B	17	14	53%	71%
J	21	8	62%	88%
F	34	25	64%	80%
Fe	13	10	75%	80%
H	18	6	88%	66%
Fo	18	12	83%	75%
P	36	16	44%	81%
W	24	21	54%	76%

TABLE IV

Subject	*Total actual No. judgments of*		*Of these, correct*		*Percentage of all judgments correct*
	Old	*New*	*Old*	*New*	
B	13	18	69%	55%	64%
J	14	15	53%	46%	69%
F	27	32	81%	62%	71%
Fe	11	12	72%	83%	78%
Fo	16	14	81%	64%	73%
P	19	33	84%	39%	55%
W	18	27	72%	59%	64%

In the case of subject H, the discrepancy between the number of judgments of old and of new was so great as to make comparison useless.

Turning to Table III it will be noted that only one subject (F.) gave the same results in the unknown and in the known series. All subjects who, in the known series, gave results to the effect that the old content is more likely to be judged old,

now give the opposite relation. Fo. is the only subject for whom old judgments are more likely to be judged old.

It thus appears not only that a difference in the instructions produces a decided change in the complexion of the results, but also that in the overwhelming majority of cases, where the subject does not know what alteration will be introduced, new content is more likely to be judged new than old old. This change denotes in general a greater wariness when the alteration is unknown, the subject not being willing to accept content so readily as old. As we have under these conditions circumstances that approach the way we are operating in normal life, we must regard the unknown series as giving us more insight into the usual workings of the recognitive process than does the known, and we may say that the general law is that no content is recognized as old unless it can show good reasons for such a reception.

Turning now to Table IV we find that, corresponding to the results just noted, for six of the seven subjects, the old judgments were the more reliable. Fe is the only exception to this rule. This result is of course directly opposed to what we found in the known series. We will see that these results are correlated with certain peculiarities in the introspective reports which will be noted later.

(3) Surety of Judgment

In all the following sections, the unit, in series with a change of order or of arrangement, is the group; in the series with a change of individuals, it is the individual.

We divided the judgments into two classes; those which the subject reported to be characterized by a relatively great degree of certainty and those in which more or less doubt and questioning was present. It is obvious that there is absolutely no way to avoid a certain amount of arbitrariness in classifying. In the first place, there are a larger number of qualifying adjectives that the subject may use which make it difficult to classify many judgments. Then in reading the reports there is always the difficulty that the same judgments get very different meanings in different contexts. Thus, for example, a judgment of "pretty sure" may mean a relatively great amount of cer-

tainty, as when the subject means, "Yes, I am pretty sure of that," or it may mean that there is considerable doubt, as when the tone of voice indicates that he is, after all, *only* pretty sure. Efforts to overcome this by care in taking introspections are of but little avail in a large number of cases.

The reports in respect to this matter show that the results vary with the different individuals and with the different instructions.

TABLE V. KNOWN SERIES

Subject	*Percentage of Old Judgments plus surety*			*Percentage of New Judgments plus surety*		
	Order	*Arrangement*	*Individuals*	*Order*	*Arrangement*	*Indiv.*
B	68%	75%	57%	60%	17%	50%
J	40%			28%		
F	70%	00%	53%	39%	70%	33%
Fe	87%			50%		
H	80%			62%		
Fo		00%	60%		41%	74%
P		33%	36%		38%	57%
W		91%	64%		50%	61%

The percentage of sure judgments shows large variations from individual to individual. Six subjects (P., J., F., Fe., W., and H.) report as a general rule that the greater percentage of their old judgments than of their new are accompanied by subjective certainty; one (P.) reports the opposite relation; and for one (Fo.) there is no difference. It should be noted here that the percentages vary with the different relations that are changed No general rule can, however, be laid down in regard to which alteration produces the greatest number of sure judgments. We may say, however, that, in the large, the majority of the subjects are more sure of their old judgments.

TABLE VI. UNKNOWN SERIES

Subject	*Percentage of Old Judgments plus surety*	*Percentage of New Judgments plus surety*		
		Order	*Arrangements*	*Indiv.*
B	92%	75%	67%	57%
J	64%	33%		
F	51%	00%	22%	38%
Fe	40%	27%		
Fo	50%		60%	44%
P	53%		50%	24%
W	64%		75%	47%

Again, we find that a change in the instructions produces a decided change in the percentage of sure judgments of any one

type returned by most of the subjects. On the other hand, there is an unaccustomed unanimity among the different subjects. Five of the seven found that a greater percentage of their old than of their new judgments was rendered with surety, and for the other two (Fo. and W.) there is no difference. In general the same relation appeared in the known series; but the results are much more uniform here, and in no case was a subject found to return a greater percentage in the case of new judgments. We shall show later on that this is correlated with certain peculiarities of the introspective evidence.

(4) Time of Judgments

The decisions were classified on the basis of whether they were reported prior to the closing of the shutter (5 sec.), *i.e.*, while the stimulus was still perceptually present, or were the result of deliberation lasting until after the shutter was closed.

Again we are dealing with results that vary with the individual and with the instructions.

Table VII. Known Series

Subject	*Percentage of Old Judgments while Open.*			*Percentage of New Judgments*		
	Order	*Arrangements*	*Individuals*	*Order*	*Arrangements*	*Indiv.*
B	23%	75%	71%	40%	17%	25%
F	70%	60%	77%	39%	75%	100%
Fe	87%			83%		
Fo		100%	100%		75%	100%
P		100%	90%		85%	57%
W		75%	42%		100%	57%

We are unable to find any predominant tendency. In the case of three subjects (B., Fo., and P.) more old than new judgments are returned in five seconds; the reverse relation holds for F. and W.; and Fe. shows no difference. Also the proportion varies with the different alterations, but no rule can be laid down.

Table VIII. Unknown Series

Subjects	*Percent of old judgments while open*	*Percent New Order*	*Percent New Arrangement*	*Percent New Individuals*
B	50%	50%	33%	29%
J	55%	57%		
F	80%	50%	22%	62%
Fe	100%	100%	(based on 8 and 7 judgments, respectively)	
Fo	62%		80%	89%
P	88%		86%	87%
W	76%		83%	79%

With the exception of B., F., and W., the results change with the instructions. Moreover, no general law can be laid down, individual variations playing too large a rôle.

If we consider the matter from the point of view of whether the judgment is rendered before the closing of the shutter in fifty per cent of the cases or better, we get the following results.

Known Series

Fifty per cent or more of the old judgments returned in five seconds.....five subjects. (B. not.)

Fifty per cent or more of the new judgments returned in five seconds.....five subjects. (W. not.)

Unknown Series.

Fifty per cent or more of the old judgments returned in five seconds.....six subjects. (B. not.)

Fifty per cent or more of the new judgments returned in five seconds.....five subjects. (B. and F. not.)

It thus appears that for the majority of the subjects the judgments of all classes were returned before the perceptual content was removed. This was not so in the case of B. All other subjects conformed to the rule except in a few instances with one type of judgment.

(5) Unitary Character of the Percept

There are two possible patterns of attention. The subject may apprehend the group as a whole, *i.e.*, it may form for him a perceptual unit, or he may apprehend and attend to the individual members of the group in sequence. Under the latter conditions one individual fades into the fringe when the other is in the focus. An attempt to see whether these differences in the action of the attention form the basis for distinguishing between content judged old and that judged new led us to a negative answer. No correlation between any particular mode of functioning of the attention and any particular cognitive distinction could be shown to exist.

There is a certain amount of individual variation and the instructions and the particular alteration have an effect. For

subject B. the rule is that all groups are apprehended as a whole. For F., W. and H., there are cases of both kinds of process, with both kinds of judgments. In the case of Fe., the groups are as a general rule split up under all conditions. With J., and Fo., the old groups are predominantly taken as units, while the new ones are separated into their constituent parts. With P., the matter varies with the instructions. Where the alteration is known, both types of judgments are accompanied by the dissociating tendencies, while in the unknown series, the old groups are dealt with in both ways. In the case of Fo., where the judgment was returned that the alteration was one of arrangement, a group was always reported as being composed of two relatively individualized units. This is the nearest approach that we have to anything like a correlation between a peculiar pattern of attention and a particular judgment. It holds good only in the case of one type of alteration. As, however, old groups also were perceived in the same manner on occasion, this gives no basis for differentiation.

(6) Distribution of Judgments

In the unknown series, not only are altered groups judged old and unaltered new, but the subject may err also in stating exactly what change has taken place, although he is sure that some sort of rearrangement is present. This happened with practically all subjects, and is of interest as indicating that novelty will make itself felt even when the subject is unable to specify the kind of alteration introduced.

(7) Mood

In the reports recorded under this head, we did not include the cases where the feeling of familiarity was reported. It was the intention of the experimenter to take up the matter later under conditions which would allow of a better chance for analysis. At present it seemed that, lacking such analysis, it was not possible to tell whether when a feeling of familiarity was reported, the subject really was referring to a phase of the content of the experience or was merely indicating that he was

conscious that he had seen the pair before. To avoid misapprehension, however, it might be well to say that with a few exceptions, a feeling of familiarity was never mentioned. This was especially noticeable in the case of subject P., a trained observer, who reiterated over and over again that no such feeling ever appeared as far as he could determine, but that what was present was a consciousness of reference.

TABLE IX. KNOWN SERIES

Subject	*Order*		*Arrangement*		*Individuals*	
	Old	*New*	*Old*	*New*	*Old*	*New*
B	53%	80%	50%	67%	57%	62%
J	50%	57%				
F	23%	07%	00%	20%	00%	00%
Fe	08%	30%				
H	00%	27%				
Fo			00%	50%	46%	44%
P			33%	37%	08%	14%
W			75%	100%	42%	57%

TABLE X. UNKNOWN SERIES

Subject	*Old*	*New Order*	*New Arrangement*	*New Individuals*
B	33%	50%	78%	86%
J	64%	73% (all new)		
F	03%	17%	50%	74%
Fe	09%	27% (all new)		
H	17%	00% (all new)		
Fo	19%	21% (all new)		
P	10%	12% (all new)		
W	07%	11% (all new)		

In the unknown series, with the subjects who did not react to series where all three alterations had been made, we have indicated the percentage of *all* new judgments accompanied by moods and have not made separate computations for the different alterations.

It will be noted that in the majority of cases no mood whatsoever was detected by the subject as accompanying his reaction. Nevertheless there were a number of moods which when they did appear were peculiar to specific judgments. Thus we find that the following were reported with old content at different times and never with the new units:—comfort (5 cases in all), security (10), ease (2), lack of ease (1), restlessness (1), certainty (3). The following were peculiar to the new content:—interest (3), wonder (1), disappointment (1), inquisitiveness

(3), coldness and remoteness (1), a feeling of being baffled (1), feeling of being at rest (1). Moods common to both were: curiosity (32), annoyance (8), satisfaction (22), discomfort (3), surprise (24), amusement (4), strangeness (3), dissatisfaction (4). The numbers in the parentheses indicate how many times any specific mood appeared in the course of the whole experiment.

While they are by no means necessary and inevitable accompaniments of the judgments, there appear to be certain moods which are present with one type of judgment only. As such they must be classed as criteria, as when they are present a specific reaction invariably takes place. We emphasize again that the evidence here presented overlooks for the time being the question of a feeling of familiarity. We have, however, already given reasons why we consider that this (if it exist at all) is a relatively rare phenomenon. Lastly we note that the mood correlated with novelty is not surprise as was alleged by Perky. On the contrary, we find that surprise occurs with either type of judgment.

Affective Tone.

TABLE XI. KNOWN

Subject	*Percent Pleasant*		*Percent Unpleasant*	
	Old	*New*	*Old*	*New*
B	68%	10%	14%	35%
J	10%	14%	00%	14%
F	03%	09%	07%	09%
Fe	39%	30%	08%	00%
H	00%	27%	00%	00%
Fo	36%	22%	14%	14%
P	40%	13%	07%	20%
W	11%	14%	28%	19%

TABLE XIII. UNKNOWN SERIES

Subject	*Percent Pleasant*		*Percent Unpleasant*	
	Old	*New*	*Old*	*New*
B	54%	15%	11%	27%
J	21%	07%	00%	00%
F	03%	09%	07%	06%
Fe	46%	40%	07%	00%
H	33%	17%	17%	00%
Fo	06%	07%	12%	14%
P	16%	12%	05%	12%
W	07%	11%	07%	00%

We note here, in the first place, that the great majority of

all judgments were neutrally toned. In the second place, there is no correlation between any particular tone and any particular judgment. This is directly contrary to the doctrines enunciated by both Titchener and Külpe. It should also be noted that the results vary from individual to individual, and also with instructions. It is probable, however, that this is a pure matter of chance, inasmuch as the cases are so few in number, where any affective tone at all was recorded.

(8) Motor Phenomena

There were certain motor phenomena the appearance of which were noted only with particular judgments.

1. A feeling of right-and left-handedness. In the case of B we noted that there was a right- and left-handed attitude that accrued to each individual of a pair in virtue of its present situation. With him this does not seem ever to have served to influence the judgment, as it was a mere accompaniment of the present situation, a right-handed feeling always occurring with a present right-handed individual even though the position occupied was judged to constitute an alteration. There was, in other words, a correlation between the feeling and the present situation, but none between the former and the old conditions expressed in the judgments. With J, however, the phenomenon was of real value in guiding his judgments. We believe that we are here dealing with a criterion, as there is a correlation between the specific attitude and the judgment returned concerning the former situation. Twice J. said that immediately on the appearance of the stimulus, there was a feeling of strain with one of the individuals in the opposite arm and shoulder. Both times J judged that the order had been reversed; both judgments were correct. In a third instance there was a correspondingly localized feeling of strain with each of the figures that confirmed their positions on the sides on which they appeared. This judgment was also correct. It appears, then, that although this phenomenon was relatively rare, it actually served to guide J on his reactions on occasion.

2. General motor clinch. With B., we have another motor

phenomenon which is of much more significance. In a number of cases, where individuals or whole groups were judged old, B. spoke of a tendency to get out towards the recognized units. This occurred, even in instances where the order or arrangement was judged changed. It is, then, a criterion, not of the fact that the whole complex is unaltered, but that the elements composing it were the same. Also, in the unknown series, in 57 per cent of the cases where the individuals were judged to have been altered, B. said that he was conscious of a movement of withdrawal. Here, of course, we have concomitant variation, a particular type of motor phenomenon being correlated with a particular type of judgment. And this, as we said in the beginning, is the sole basis on which we can hope to establish structuralistic criteria. J. also reported much the same thing. Here, we have no evidence of what might be called the negative clinch, but on the other hand, with old content, J. spoke of a tightening of the muscles of the neck and shoulders, a sort of general affirmative kinaesthesis. There was only one exception to this rule, where with an unfamiliar individual the same thing took place. In this case, however, its appearance was delayed. Aside from this, it occurred nine times in all. In the records of H. also, in one instance where a pair was judged completely unchanged, we find mention of a forward movement of the whole body at the time of recognition.

3. Miscellaneous. In two cases, J. spoke of a tendency to outline a geometric form, and judged the individuals to be old. The judgments were correct. Fo. reported in one instance a feeling of lack of muscular balance where the arrangement had been altered, and on a second occasion spoke of an attitude of outlining a triangle, which led to its acceptance as an old figure. Both of these judgments were correct.

All other subjects reported that no such phenomenon was ever present. We see, then, that the criteria used in differentiating old and new content are different for different individuals. This fact is of great importance. No theory of recognition has ever succeeded in bringing forward clear proof of its validity and

they have all tended to assume that the differentium of the recognitive process lies in one or two factors which are common to all individuals. As subsequent experimentation did not find these factors present with some individuals, the theories were rejected. Nevertheless they may have been correct in depicting what lies at the basis of recognition for some people. The fact that given criteria are not universally in evidence, does not prove that they are not criteria in some instances.

(9) Action of the Attention

It is conceivable that there may be two distinct ways in which the attention acts. In the first place, the subject may look at the stimulus, apprehend it instantaneously, and relax his attention or let it slide over to something else. In the second place, the attention may be strongly called to the presented situation, may be "snagged," so to speak, on the content, and this may involve a long period of effort and manipulation. We have already noted previously that Meumann posits the first as the pattern of the attentive process in the case where the subject is dealing with old content. We, however, were unable to find any sort of concomitant variation, except in one case. The attention may be immediately relaxed and turned to something else, or it may be prolonged, involving kinaesthetic strain, an effort to manipulate the existing situation, with stimuli judged old, or with those judged new. For J. in the unknown series, we find that the latter pattern is the only one present with new content. On the other hand, it also occurs with old content, and the correlation is far from universal. Still it may be said that there is a tendency for new stimuli to hold the attention. This can hardly be looked upon as a criterion, however, as there is no general one-to-one relationship.

(10) Visual Images

Visual images forms another great class of criteria. Once again, at this point, we call attention to the fact that it is not the subject's judgment that he is utilizing an image as a means of formulating his decision that we are relying upon,

as we have already pointed out that he may not know to what he is reacting or that he may be entirely mistaken in the matter. The results given here are rather based on a careful examination of the introspections, which shows that certain peculiarities of the images are only present with a particular judgment. This is, of course, as far as experimental psychology can go in establishing a casual sequence. Certain phenomena occur only with certain others. This does not mean that they are always present, but that there are no cases in which they are found correlated with a different meaning distinction. Moreover, the subject's introspection as to whether an image came before or after the judgment cannot be anything but unreliable, except in very extreme cases. Because of this, we will as a general rule omit all reference to the time order, and turn our attention purely to the fact of conmomitant variation. We found that the following peculiarities of visual images were correlated with differences in meaning:—

1. *Mere appearance.* With certain subjects, in both series and with others in the known series only, the mere appearance of visual images of the presented content or of intimate associates leads to judgments being returned in accordance with their dictates. This would mean that individuals arousing visual images are accepted, while those failing to do so (provided, of course, no other criteria, such as associations, are present) are rejected. Where it is a matter of new arrangement or order, the content of the image will settle the question. Thus, in the first case, the appearance of one of the individuals presented in the stimulus with a different partner from that accompanying it at present will lead to the judgment that there has been an alteration of arrangement introduced; and the appearance of the presented individuals in an order different from that given will lead to a judgment that the latter has been changed.

The subjects using this criterion are J., F., Fe., and P. and W. in the known series. We will give in a table (No. XIII) below, the number of cases in which an adequate visual image was present, the number of cases in which the subsequent judgments

were correct, and the number of cases which formed exceptions to the rule, *i.e.*, where the judgment was not in accordance with the dictates of the image. We will consider the latter further on in detail. It should be clearly understood what we mean by an adequate visual image. Where the subject, for instance, knows that the only alteration will be one of order, the appearance of an image of an isolated individual is of no value to him. He already knows that no new individuals will be introduced. An adequate image under these conditions is one which has sufficient import to serve as a clue to the solution of the problem in hand, *viz.*, whether the order has been altered or not. It is of course obvious that in the unknown series no visual image is ever inadequate, as in this case the subject is in need of light on all matters.

TABLE XIII

Subject	*No. of Cases*	*No. of these correct*	*Exceptions*
J	8	7	2
Fe	11	11	1
F	20	18	5
P (Known Ser.)	8	7	0
W " "	22	20	1

Four of the exceptions appeared where the image was so vague and fleeting that the subject was unable to say confidently whether it had existed or not, and was in even a worse position in respect to his ability to describe the content. We can say, then, that too great a degree of vagueness and schematic character will vitiate any claims the image may have as a valid criterion. The other five exceptions were as follows. Four of them were in the case of F. Three were cases in which conflicts between two different images took place and we will consider them later. The fourth will be taken up under the subject of manipulation. The last exception was reported by W. Here shades of the same color appeared in two successive pairs, and the result was the arousal of so large a number of images of different tints and hues that the subject was unable to come to any conclusion and rejected the individuals.

2. *Stability.*—In this case, where the image of the presented percept is stable and does not tend to fall apart in space, the

content that it represents is accepted as a duplicate of the past, while instability leads to a judgment of novelty. The subjects using this means of differentiation were B., Fo. in the case of known arrangement, and W. in the unknown series. It appears then that the criteria used not only vary with the individuals and the instructions, but also with the particular alteration involved.

TABLE XIV

Subject	*No. of Cases*	*No. of these correct*	*Exceptions*
B	42	30	7
Fo (Known Arr.)	9	7	0
W (Known)	2	0	0

B.'s results are most interesting in this connection. There seems even to have been a certain amount of correlation between particular types of instability in space and particular changes in the group. In the case of changed order, the instability may be of a very incipient character. We find B saying that when he attended to the visual image of one of the two individuals, the image of the other tended to fall off into the fringe: or it may happen that the image which came initially as the copy of the presented situation would suddenly experience a transformation and one individual would move over to the other side of the second. Again one individual would move up and away in space. When the arrangement was judged changed, B. reported that one individual moved off and down in space, while a new one tended to move back from the other. The correlation is not universal, but is striking enough to be significant. Of the exceptions in the case of B., two are due to the fact that the records are not clear on the points in question. Three other cases were visual images of content associated with the groups, and led to old judgments. In the last two instances, the image was rejected because of a negative motor reaction in the one and of a delayed associate in the other.

3. *Locus in Space.*—Two subjects used this as a means of differentiating the two kinds of content. For Fo., whatever placed itself on the side of the drum where the initial pair had been presented was accepted and the content that it represented was

judged old; whatever appeared on the new side was judged new (except in the instances where it was known that the arrangement was changed, for which see stability above. Here the locus made no difference). H. also employed this method in determining whether or not a specific individual had been on the side on which it was re-presented. We have here an instance in which the subject was keenly conscious of the correlation between a phase of the content and her judgments. When an image of an individual placed itself over the percept that corresponded to it, the order was judged unaltered, but if it placed itself over the other individual a change was judged to have taken place.

TABLE XV

Subject	*No. of Cases*	*No. of these correct*	*Exceptions*
Fo	31	26	4
H	4	4	0

One exception with Fo. is due to the incompleteness of the record. Two others were cases where the images of numbers failed to show all the digits and hence they were rejected. In the last instance, an association overcame the testimony of the image. The exception reported by H. is due to incomplete records.

4. *Image of a Pair Containing on Individual not Present in the Percept.*—Where an image came up composed of one individual present in the percept and one not so given, some subjects judged that there had been an alteration of arrangement, regardless of the stability of the image. These subjects were Fo. (known arrangement) and W. in the unknown series.

TABLE XVI

Subject	*No. of cases*	*No. of these correct*	*Exceptions*
Fo	4	4	0
W	7	7	1

The one exception reported by W. appeared where the image was so vague that the record gives no further details concerning it.

Duality.—In the unknown series, P. accepted all visual images which represented pairs which differed from those given

in the percept. Associated images were also accepted. All images of the perceptual content itself were simply regarded as useless, being compatible with either judgment. This is easily understood from a logical point of view. The image of the present content is likely to be aroused by the stimulus, and hence may owe its appearance to the present situation. The image of content other than that presented in the percept has no such grounds for existence. There were three instances in which the image did not correspond to the percept. The judgments of novelty were all correct.

6. *Immediacy.*—In the unknown series, W. accepted as criteria images which represented the presented content, provided they came immediately. (Stability and Immediacy vary concomitantly. See Stability.) Otherwise the image was compatible with either judgment. There were ten cases where images of pairs and individuals presented in the stimulus came immediately, and in eight of them the judgments were correct. In seven cases, the image was delayed. In five of these instances, the content was judged in a different way from the implication of the image; in the other two, in accord with it.

8. *Failure to submit to manipulation.*—In one case F. tried to place the visual image of a pair on the side of the drum where the initial series had been presented. One individual took up its place there and stayed. The other would not. This led to judgments of old and new respectively. Both judgments were correct.

9. *Mode of Entrance.*—Fo. judged the arrangement to be new when the presented pair came in piecemeal, *i.e.*, one individual trailing in after another. In contrast with this, we find that the old judgments were correlated with images that came in as a whole. There were seven such instances of succession in appearance. All the judgments were correct.

10. *Conflicts.*—Conflicting images were frequently met. We find that under these conditions, the more permanent, *i.e.*, the image that is less fleeting, or the more stable, *i.e.*, the one which coheres best in space (F.), or the more assertive, that which keeps

tending to reappear in the focus of attention irrespective of the desire of the subject (W.), is the one which is accepted.

We note in summarizing, that the criteria employed, even within the sphere of visual images, differ from individual to individual. Moreover, the difference in instruction (known vs. unknown series) is a decisive factor. Thus W. accepts all images in the known series, while in the unknown, she accepts only the stable or the immediate. Moreover, differences in the particular alteration introduced cause a fluctuation in the particular criteria employed. Thus Fo. normally relied on locus in space; but in the case of known arrangement, accepted *any* pair containing an individual not present in the percept, and rejected the unstable and those that came in piecemeal.

In the next place, we note that all the peculiarities are such as can be readily subsumed under the concept of habit. Appearance vs. lack of appearance of images (effectiveness for central excitation, ability to arouse concrete activities), stability vs. instability, location in an old place vs. location in a new, immediacy vs. delay, etc., are all of them antitheses which from a psychological point of view may be considered as representing two poles in a content where the relationships of the elements have been altered.

Moreover, we note that in a number of instances which constitute a small proportion (16 per cent), it is true, of the total, the criteria are correlated with incorrect judgments. This is, we believe, no evidence against their validity as being the basis of the decision. It is, of course, well known that we are constantly subject to error in regard to the matters in question, and the fact that we find here certain reasons which can be given for this incorrect classification is rather a point for than against the whole doctrine. This also seems to make it intelligible why the *exceptions* occur. The subject in his own experience has found that his criteria are not absolute, and hence regards them more or less askance. Consequently on occasion, he will defy their authority and judge in ways which are not in accord with their dictates. Sometimes he gains by this, but sometimes he loses.

In conclusion, we note that wherever the criteria used differ

from the known to the unknown series, the alteration is one which shows that under the latter conditions the subject is more wary about giving credence to any content. Thus in the case of P., for instance, we find that all visual images are accepted as criteria in the known series, while in the unknown series, only images which represent pairs other than those given in the percept are utilized. W. shows much the same type of change, as can be seen from the above. We may say, then, that the more indefinite the problem and the greater the chance of error, the more specifications the subject lays down which the image must fulfill for acceptance.

This latter peculiarity makes it easy to explain the alteration in the relative reliability of old and new judgments from the known to the unknown series. We found that in contrast to the conditions existing in the known series, in the unknown series the old judgments are more reliable. This fits in nicely with the results of the last paragraph. For where more requirements are laid down which the criteria must meet if judgments of oldness are to be returned, we would naturally expect these judgments to be more often correct. On the other hand, this increased care naturally adds to the number of instances in which old percepts which cannot present clear credentials will be rejected, a proceeding which undermines the reliability of the new judgments. Thus our introspective and our quantitative results fit in together, a fact that strengthens the claim of the general doctrine presented.

(11) Associations

In the case of associations, also, we find that there is a variation from individual to individual, and from series to series. No difference can be observed with the various alterations, however.

The question of the adequacy of any association has to be taken into account, if we are to look upon it as a content capable of mediating a judgment. We will say that an association is adequate to mediate a decision of familiarity provided (1) it is believed by the subject to come from the past. This does not mean that the subject explicitly judges that it comes from the

past, but that he judges in accord with it (concomitant variation). (2) The second condition is that an association must be sufficient, *i.e.*, there must be enough in its content to mediate the particular judgment made. Suppose that I have the pair of nonsense syllables "mon fif," and that I have formed the association, "man blowing a fife," with them. Now, on re-presentation of the new series, the order given is "fif mon." The old association is, however, resurrected and considered to be valid. It is obvious then that the decision that the pair had been changed would be involved in the association itself as the order of the words demands a different order of the syllables. Suppose, however, that I had only the associate "man," which returned when I saw the pair again. If then under these circumstances I also decided that the pair had been changed in respect to the order of the individuals, I could not attribute the judgment to any implication of the association, even though I accepted the latter as having constituted a part of my past experience. The association is insufficient, though believed. It follows from the foregoing discussion that there are three classes of associates possible: (1) those which are sufficient and believed, (2) those which are insufficient but believed, (3) those which are rejected, *i.e.*, are looked upon as products of the present situation.

Omitting, then, all insufficient associations, inasmuch as they contribute nothing to the results, one way or the other, we find that the following properties of associations serve to give them the power to mediate judgments, *i.e.*, make them adequate.

1. *Accepted as they appear.*—In this case, the judgment is rendered in accordance with the implications of the association, the mere appearance of which is sufficient to guarantee its being considered to come from the past. Its presence will lead to the acceptance of individuals arousing it, while its absence will be looked upon as a basis for rejecting individuals, unless other criteria are in evidence. Moreover, its meaning, if adequate, will determine the judgment returned in the matter of the order and arrangement. (See above illustration.)

The subjects who accepted associations as they came were J. (except the names of geometric figures, q.v.), F. (except names

of colors and geometric forms, q.v.), Fe., H., P. (as J.), and Fo. in the known series. The following table indicates the number of cases where associations mediated the judgment and also the number of exceptions to the rule. The latter comprise the instances where content was judged new in spite of the presence of sufficient associates.

TABLE XVII

Subjects	*No. of cases plus Associations*	*Exceptions*
J	13	0
F	84	3
Fe	30	1
H	32	2
P	35	4
Fo (Known Ser.)	18	3

With F., one of the exceptions is accounted for by the fact that the subject said that he believed that a new individual was about due. As a consequence, he rejected the individual even though it aroused an association. In a second case, the association itself implied the rejection of the individual. With Fe., in one instance, the order of a pair was judged reversed although the presented order aroused a sufficient association. The subject said that the idea was so obvious and so familiar that if she had had the pair before she would unquestionably have had an anticipatory image of it. As no such image was noted, the pair was judged reversed which was correct. One of the exceptions reported by H. is accounted for by the fact that the system which she had worked out in connection with the presented series "would not work." It appears that it was not sufficiently definite to be useful. The other exception falls under the head of conflicts (which see below). Two of the cases reported by P. can be explained by the fact that the associate was, so to speak, implied in the very syllable judged new itself. The attempt was, of course, made to get syllables with a minimum of meaning attached to them. When a subject uses auditory imagery this is not always easy, however. Thus the syllables Yir and Gef suggested "year" and the name "Jef" respectively. The point here seems to be that an associate of this kind, which is, so to speak, inherent in the very syllable itself, is not a guarantee of

oldness. One might say it is too obvious. Fo. rejected three individuals arousing associates. In one of these instances, the judgment was due to a definite visual image. In the second case, the associations aroused were ideas which had been involved in the work with the previous pair, and were hence looked upon with suspicion. The other is a true exception. Taking into account these factors that I have just mentioned, there are of course still a very few (4) bona fide exceptions to the rule.

2. *Immediacy.*—We have already discussed this matter in the case of visual images. The content arousing an associate immediately is judged in accordance with its implication (mere presence being sufficient for the accepting of individuals), while delay in the appearance of the associate leads to the rejection of the pair or stimulus arousing it. The subjects using this criterion are B., W., and F. (in the unknown series).

TABLE XVIII

Subject	*No. of immediate associates accepted*	*Exceptions*
B	21	0
W	29	5
Fo (Unknown Ser.)	14	5

TABLE XIX

Subject	*No. of delayed Associates plus new Judgments*	*Exceptions*
B	2	0
W	10	3
Fo (Unknown Ser.)	4	0

There were six cases where adequate associates were not correlated with any judgment concerning their immediacy. We omitted these from the record therefore. That this was not favorable to our conclusion is obvious from an examination of the introspections, all of which tend to show that the associates were probably immediate.

With W. the correlation is less universal than with the rest of the subjects. A good visual image led to the accepting of the content in one instance in spite of a delayed associate. The other four cases where content arousing delayed associates was accepted are clear exceptions, as are the three where immediate

associates are correlated with new judgments. Three of the exceptions noted with Fo. were due to the presence of visual images.

Quality.—J. and P. regarded the ability to name geometrical forms as being entirely irrelevant, *i.e.*, either judgment may be returned with individuals so named. F.'s reports show the same reaction to the names of colors, and to those of geometric forms in the unknown series.

Contradictions.—We find in two cases of contradictions that F. accepted the first alternative which offered itself, while H. accepted the second. The logic of the second situation seems to be that if anything puts in an appearance as the result of prolonged consideration, the assumption is that there must have been some reason for it, and hence it is looked upon as a valid basis of judgment.

We find that the introspections given by Fo., who used different criteria in the known and the unknown series, bring out the identical peculiarity noted in the consideration of visual images. There is an additional condition laid down which must be met if the content is to be accepted. Mere appearance is no longer adequate, immediacy is also required.

There were among the judgments returned on the basis of these criteria a small number of errors. These are readily understood. The inherent suggestiveness of new pairs may be so great that they arouse associates, and thus lead to judgments of oldness. Moreover, immediacy and delay are relative terms, and the subject may consider (or react to) an associate as delayed when relatively speaking it is not so. In consequence we can readily understand the exceptions of the rule. As appeared when we were studying the visual images, we find that associates lead us into errors in life and we are hence somewhat sceptical as to their absolute validity. As a result they are, on occasion, disregarded. Sometimes the subject gains by this, but sometimes he loses.

These peculiarities are manifestations of the working of the principle of habit. The ability to arouse associates is, of course, a result of irradiation of the nervous excitation over associated

tracts, which would be already worn in the case of an habitual or old stimulus, as connections had been established at the time of the earlier presentation. A new stimulus would fail to find any such pre-established paths, and associates would hence fail to appear. The immediacy and delay of associates would be explicable on the same basis, the impulse needing more time to work over into other brain areas, where the tracts have not been opened up as the result of an earlier presentation. The lack of value attached to the ability to name geometric forms and colors may also be looked upon as the result of the activity of habit. We are so used to giving some sort of a designation to forms and colors, in other words this type of reaction is so thoroughly habitual, that it is altogether intelligible that the subject should not attach any importance to its presence. It is a case of too much habit. The thing is so automatic that there is no guarantee that it has not been done on the spur of the moment.

(12) Organic Sensations

There were practically no instances in which organic sensations were reported with any subject. This does not mean, of course, that careful attention would have failed to discern the ordinary sensations from the body, but that the subjects failed to find that there were any distinct and differentiable complexes.

Fe. was the only subject who stated that the organic background of a new stimulus was different from that of an old one, and this occurred but once. As a goodly proportion of the judgments were not expressive of direct apprehension, since doubt and deliberation were present, this evidence tends to prove that for our subjects at least the feeling of familiarity, analyzable into pleasantness and organic sensations, which Titchener considers to be the prime factor in recognition, was non-existant. Likewise Külpe's theory that direct recognition which does not involve the reproduction of sensations repeating circumstances of the original situation, is due to a mood, which is, of course, for him a complex of organic sensations and affective processes, does not fit in with the results here reported.

(13) Rhythm

H. judged old a pair having a decided rhythmical quality when articulated. This is a peculiar and unique criterion, emphasizing the individual character of the standards used.

(14) Classes of Judgments

We come now to a consideration of the question as to whether the factors enumerated as criteria were universally present when judgments were returned, and if not, whether we can formulate a statement of the general conditions under which they were. In going over the introspective results, we found that there seemed to be in general five classes of judgments which may be distinguished:

1. Cases where the judgments were made immediately in time without the intervention of any observable mediating content, other than the percept itself. In these instances, the subjective certainty is great. It might on occasion happen that an associate would present itself immediately following the decision or that a visual image would appear to confirm the judgment. I have called this class of judgments, characterized by their immediacy (in time), their subjective certainty, and by the lack of any mediating content outside of the *percept itself,* A1. When associates, etc., later put in an appearance, I call it "unrolling of content." These terms are merely for convenience. Judgments of this type constitute 18 per cent of the total number, and 81 per cent of them were correct.

There are two possible explanations of this phenomenon. In the first place it may be that there are criteria (other than the percept) actually present in these cases, but that either our concepts are inadequate to grasp them, or the whole process is so quick and automatic that the subject is not able to isolate them. This possibility must be frankly recognized, and we make the following statements subject always to revision from such a point of view.

On the other hand, we are inclined to a different explanation in the light of the following facts. First, all experimenters have

reported cases where they were unable to isolate anything beyond the mere judgment or meaning of known and unknown or their equivalents (in addition to the percept). Secondly, the judgments grouped under the head *A1* form a definite class, characterized by a specific set of properties. If they are to be explained as being due to the failure to note criteria, we should naturally expect to find them scattered here and there, and lacking any common properties that would group them together. For the failure to note criteria should crop out at irregular intervals, being directly due to fatigue, inattention, practice leading to stereotyped response, distractions, etc. Thirdly, our introspections were as exhaustive as we were able to make them. In view of these facts we are inclined to think that the following explanation is correct.

These are judgments in which the perceptual object itself is the mediating content. As a change in the stimulus may lead to a change in a motor reaction, as we use a different stroke in playing a ball with a different bound in tennis, so a difference in the percept may lead, on its own account, to a varying cognitive classification. A changed stimulus brings with it a judgment of novelty, an unaltered situation results in a judgment of oldness. We are justified in believing that the content which is effective in determining the response is the character of the percept itself, by the fact that there is so great a degree of correlation between the meaning distinctions reported and the actual status of the object. The percentage of correctness is 81 per cent. If there were no guiding factors at all in the situation, if as the exponents of unmediated cognitive distinctions maintain, there is no necessary relation between any phase of the content and the meaning, there should be no pronounced correlation between the two phases. Our figures show that this latter exists, however. In as much, then, as there is obviously a correlation between content and meaning, and as there are no differences in content except those contained in the percept, the latter must be the guiding factor. Moreover the fact that the reaction comes immediately tends to show that the percept itself is the efficient agent. There is no period of doubt, but the mere appearance of the

percept induces the response. This seems to show that the stimulus is sufficient in itself to allow of the cognitive reaction.

It is true, we believe, that no exponent of an unmediated recognitive reaction (such as Höffding) would ever had denied that there was a factual correlation between the stimulus and the meaning. But we object to having this type of judgment called unmediated. For the reasons given above (to which others will be added later) we consider our decision of the A_1 class as truly mediated. But the mediating factor is the percept itself. In conclusion, we note once again the highly interesting fact that the only cases where this particular relationship holds is where the judgments are highly automatic and certain. It practically never occurs that, when there is doubt, the percept alone is adequate to force the decision. Only where the past series has been firmly fixed, where it for some reason made a deep impression on the subject can the latter dispense with all aid except the stimulus.

2. There is another class of judgments in which the decision is sure and immediate in time, but there is also mediating content which comes with it. The two (judgment and content) may be so nearly contemporaneous in their appearance that the subject cannot tell which came first, but the main point is that the content does not come consciously after the decision. This we call class A2. It constitutes 30 per cent of the total number of judgments and 89 per cent of the cases are correct.

3. We come now to the judgments where there is a certain amount of doubt with subsequent conscious decision. In this case, the subject appeals to criteria other than the percept. This does not mean that he is aware of what the criteria are and can isolate them as they come in. What actually happened is that he is not sure of what decision he should return and stops to think. In the course of time he comes to a decision. Just what is the efficient agent in relieving the tension, *he* may or may not be conscious of. The fact is that a careful examination of the introspections indicates that there are certain peculiarities of content which are present only when a specific judgment is returned. Hence these are to be looked upon as the criteria which

have brought about the decision even though the subject does not isolate them as such. We have spoken of these matters before.

These criteria may be positive or negative. Under the head of positive criteria are classed all peculiarities of content such as unstable visual images, delayed associates, etc. These are definite data which can be observed. The decisions reached on the basis of such criteria vary in the degree of subjective certainty accompanying them. The judgments may be looked upon as undoubtedly correct or they may still be regarded with distrust. Such judgments where we have doubt followed by a decision on the basis of *positive* criteria we call class B1 if the final stage is characterized by a high degree of subjective certainty, and B2 if doubt still lingers. They comprise 30 per cent of all the cases and 72 per cent of them are correct.

4. On the other hand, the result of the reflective period may be that no additional content, no images, associations, etc., appear. The percept stands isolated in consciousness. Under these conditions the general rule is that the content is judged new (in 78 per cent of the cases). This lack of associated material and failure to stir up any reaction constitutes what we have called a negative criterion. The resulting new judgments are generally (81 per cent) returned with more or less misgiving. They are also very unreliable, only 44 per cent of them being correct.

From these data a number of interesting conclusions follow. In the first place, the objection might be made that we are not here dealing with mediated judgments at all, that our so-called cases with negative criteria, are really instances where the ultimate unmediated consciousness of novelty is in evidence. This is refuted by the fact that in 78 per cent of the cases where no decision was reached immediately and surely on the presentation of the stimulus (A1 and A2), where *i.e.*, a period of doubt was observed, and where no positive factors appeared to settle the difficulty, the content was judged new. There were, if anything, more old stimuli than new. If then an unmediated consciousness of status lies at the basis of these decisions, they should be approximately evenly distributed between classifications as old and

as new. But that in the great majority of instances novelty is declared for, proves that the absence of a positive criterion is itself a ground for judgment.

In the second place we see that the negative criteria are thoroughly unreliable, only 44 per cent of the judgments being correct. This is very strong additional proof that in the A_1 decisions the meaning is mediated by the perceptual content. In the instances now under discussion which we will classify as C, the percept is unable to arouse a definite reaction. The judgment does not come immediately (in time) and surely, but there is a period of hesitation and delay. This is not followed by the appearance of positive criteria. Here if anywhere we should have unmediated judgments. We have found, though, that the subject will then use something (lack of reactions) no matter how unreliable as a criterion. It is impossible for the subject to dispense with some basis for his decision other than internal inclination (if we except a guess here and there). Moreover, the absence of positive criteria leads to highly fallacious answers, a fact which marks off these C judgments from those classed under A_1. The latter must then have some true objective guiding principle (*i.e.* something besides an internal impulse or unmediated inclination) and the only content capable of furnishing this is the percept. The C judgments comprised 15 per cent of all.

We conclude then, that in some cases the percept itself can carry the meaning. These decisions are characterized by coming immediately, by the great confidence felt by the subject in his answer, and by a high degree of correctness. Where there is doubt, either positive criteria, or negative criteria are invoked. Unmediated decisions are rare.

5. It sometimes occurred that, in spite of the absence of any positive criteria, the content was judged old where the percept did not mediate the decision, doubt being present at first. There were in all sixty-four such cases where the subject judged the content old in spite of the absence of positive criteria. Half of them can, however, be accounted for on the basis of suggestion. They occur in the unknown series. Here there are four judgments which can be returned concerning any pair, as has been

pointed out. Now let us suppose that the individuals and the arrangement of a pair are classed as old due to an association, which however contains no reference to the order. It is more than likely, then, that if the order is judged old and the judgment belongs to this last class which we call D, the decision may be a carrying over of the tendency to accept the content which owes its origin to the association mentioned. In fact this seems to have been the real explanation of these judgments. The subject being assured of the oldness of most of the situation, merely accepts the rest without specific questioning. This eliminates thirty-two of the sixty-four judgments of the type D from any further consideration. These are not counted in the percentages.

There remain, then, thirty-two judgments of the type under discussion. Part of these again really do not belong under the D class. Since in the unknown series only one relation is altered at a time, the subject is aware that if he has once isolated the new aspect, he is justified in returning old judgments concerning all the rest. Such judgments are really reasoned conclusions. There remain, then, those cases in the unknown series where the pair as a whole was judged old without any criteria being involved, and those where one individual was judged old and the other new. To these must be added all the instances found in the known series. From these sources we obtain in all twenty-five judgments of the type D, of which 72 per cent were correct.

There are two possible interpretations of these twenty-five D judgments. On the one hand it may be claimed that they, together with the judgments of novelty on the basis of negative criteria, represent the true recognitive reaction, and that the so-called reflective stage is a later development, and is actually superfluous. The real cause of the judgments of both types is an ultimate unanalyzable consciousness of reference, which is clearly observable in the D and C decisions. The preponderance of classifications as new, referred to earlier, can easily be explained if we assume that only content which makes a fairly strong impression when presented, can arouse the meaning of oldness. If then, in addition to the truly novel stimuli, we thus have all percepts which made but little impression cognized as new, we can see why the

judgments of novelty predominate. This hypothesis seems to receive some substantiation from the fact that the subjects spoke in quite a few instances of an immediate inclination which appeared with the given content and was later confirmed by the reflective criteria. Are not these criteria, then, really products of the judgment and not the cause of it?

Against the validity of this interpretation we urge the following points:

(1) In the first place, the D judgments constitute but 10 per cent of all the old decisions returned. Even if we add to these the A1 judgments we can only account for about 30 per cent of all the old reactions without taking into consideration the cases where differences in the immediately observable content were undoubtedly present. If it were a matter of probabilities, which is the more likely, that criteria were overlooked in 10 per cent of the cases or that the subject was not influenced by differences in the two situations which occurred in 70 per cent of the judgments?

(2) In the second place, the preponderance of new judgments cannot be due to the reasons alleged. For if they were valid, and if all decisions were the result of an unmediated meaning, of an ultimate consciousness of reference, the preponderance should be noted among all doubtful judgments. We find, however, that 51 per cent of the B_1 and B_2 judgments classed the content as old. Consequently, if all decisions are due to an ultimate consciousness of reference how is the fact that new judgments erroneously predominate only when our so-called positive criteria are lacking, to be explained? And if the positive criteria are admitted to be such, why try to set up an unmediated meaning with the C and D judgments when an equally plausible explanation is at hand that does not involve a completely new point of view.

(3) An ultimate consciousness of reference which is in no way connected with other more reflective criteria, should appear during the first instant of perception. All that subsequent thought on the part of the subject can bring about is the arousal of associated ideas, visual images, etc. If judgments of oldness are not due to the latter, but are based on unanalyzable mental func-

tions, the subject should never utilize the products of the period of manipulation. Under these circumstances the immediate reaction should be final. In fact Katzaroff, who is a strong supporter of an ultimate feeling of familiarity, declares that the latter is the first step in the process. This fact has a number of important implications connected with our problem. In the first place the criteria of the reflective type either confirm the initial inclination or alter it for the better. If they were really superfluous, they should never do the latter. The initial inclination should be the most reliable guide. In the second place it is hard to believe that adult individuals would keep consciously referring (as often occurs, though not always) to factors that are really superfluous. In the last place I was fortunate in having a test which was taken in connection with a later experiment which bears directly on the point at issue. Subject Jo. who served in experimental series II, told me he always gave his initial inclination, (in those cases where there was doubt as well as in those in which the percept itself mediated a certain decision), as his judgment. Here then we have a case where we may see what is the effect of judging on the basis of the initial inclination alone. This series, concerned only with the time, is a much better basis of study than would be the series which are complicated by all the subsequent developments in the course of introspection. Jo. was working only with series in which the order was changed, under which conditions the decisions are generally characterized by a high degree of correctness. There were seventy judgments where the alteration introduced was known, of which 41 or 59 per cent were correct. Of forty-four judgments where the alteration was unknown, 29 per cent were correct. In the known series, there must have been a number of the judgments of the types A_1 and A_2 present. If we take the normal proportion of these calculated on the basis of our eight subjects used in the present experiment, we may say that these represent about 48 per cent of the total number of cases. This would leave thirty-six instances (52 per cent of 70) where there was merely a vague initial inclination, and not the immediate and certain reaction involved with A_1 and A_2 decisions. As

on the average, 83 per cent of the A_1 and A_2 judgments are correct, we can subtract 28 of them from the total number of correct decisions leaving 13 and 6 from the incorrect decisions leaving 23. This means that of the judgments returned on the basis of an initial dubious inclination, but 36 per cent (13/36) are correct. When we compare this percentage of correctness with those found with the A_2 (89 per cent) and B_1 and B_2 (72 per cent) judgments which include classifications of both oldness and newness as do those now under discussion, we can see what a difference there is between relying on reflective criteria and trusting a doubtful initial reaction. We may safely say that the initial inclination is nothing but the reaction which the subject, primed to make a decision in one direction or the other, since this is the "Aufgabe" of the experiment, experiences as soon as the material is presented. The fact that the judgments which are finally returned are generally fairly accurate leads one to believe that the subsequent developments during the process of judging, the use of reflective criteria, are absolutely vital. It is easy to understand the existence of the initial inclination, for the decision is a real process, a gradual development, and when set for such a thing, the subject naturally, even at the beginning, does not approach the problem completely without bias, but always starts with a more or less tentative reaction which is then submitted to constant revision. The difference between the initial inclination reported by Jo. and the negative criteria lies in the fact that the one represents the immediate reaction prior to any period of reflection, while the other consists in the continued absence for a moderate period, at least, of any mediating content, (even though the subject is not reflectively conscious of the significance of this fact).

For these reasons we believe that the twenty-five old judgments which were characterized by doubt unrelieved by the appearance of any reflective criteria are to be accounted partly as being guesses, partly on the supposition that criteria really present were overlooked, and partly, perhaps, by the fact that our concepts were not adequate to grasp certain relatively unusual differences in the content. That the subject should be inclined to

disregard the lack of associates, etc.; *i.e.* that he should refuse to allow content peculiarities to mediate his judgment, is easily understood when we remember that C judgments are very likely to lead to error. The subject must be more or less aware of this in his daily life, and hence we may expect to find him disregarding the warnings given and returning old judgments in place of new. We conclude by calling attention to the fact that it would be a suspicious state of affairs indeed if there were no exceptions to the general principles which we believe that we have established.

These six types of judgment exhaust all cases where decisions were returned. We never attempted to take any account of those cases where the subject was unable to arrive at any conclusion. They do not represent bona fide judgments of either type, and hence cannot be incorporated into our results. The following table gives the distribution of judgments for different subjects.

TABLE XX

Subjects	A^1	A^2	B^1	B^2	*C*	*D*
B	29	19	13	14	7	25
J	10	7	11	11	16	(in all)
F	17	36	15	24	15	
Fe	14	24	3	7	8	
H	13	29	8	8	2	
Fo	12	24	7	20	11	
P	16	15	2	20	21	
W	21	28	8	12	12	
	18%	30%		30%	15%	7%

We note that the distribution of judgments among the different classes varies with the different individuals, and that no absolute rule can be laid down in this matter.

IV. EXPERIMENTAL SERIES II

This series was concerned with the speed of the judgments. The technique was the same as that used in the previous series except that the interval of an hour was kept constant, and that the only alteration introduced was that of order. Known and unknown series were, however, used. The subject had a stop-watch in his hand. The experimenter gave a warning "now," and then opened the shutter as quickly as possible. The subject started the watch as soon as the percept appeared and stopped it as soon as the decision was reached. The unit of measurement thus obtained was one-tenth of a second.

We divided the judgments into four classes, old sure and old doubtful, and new sure and new doubtful. The decisions of most of the subjects were very unevenly distributed among the four classes, and as a consequence the results given by any individual are only reported in the groups which include a fair proportion of the decisions. In the following tables we compare the results given under the different groups *inter se,* in an effort to see whether there are any significant differences. In the column headed "difference of averages," we indicate by a letter, O or N, etc., whether the old or the new judgments take more time.

TABLE XXI. KNOWN SERIES

Sub	*Number of Jds.*		*Average*		*Diff. of Ave.*	*Prob. Error of D. of Av.*	*Ratio*
	Sure	*Doubt*	*Sure*	*Doubt*			
			Old sure vs. *Old doubtful*				
Kj	16	14	4.84	6	D 1.16	.42	2.7
			Old sure vs. *New sure*				
	Old	*New*	*Old*	*New*			
Jo	29	14	1.96	1.95	O .01	.09	.1
H	7	7	2.2	3.51	N 1.31	.38	3.4

TABLE XXII. UNKNOWN SERIES

			Old sure vs. *Old doubtful*				
	Sure	*Doubt*	*Sure*	*Doubt*			
Kj	8	6	5.45	5.45	000		
			New sure vs. *New doubtful*				
Kj	6	8	6.33	6.88	D .55	.7	.71
			Old sure vs. *New sure*				
	Old	*New*	*Old*	*New*			
Jo	22	17	1.87	2.13	N .26	.145	1.7
Kj	8	6	5.45	6.33	N .88	.645	1.3
			Old doubtful vs. *new doubtful*				
Kj	6	8	5.45	6.88	N 1.43	.74	1.9

TABLE XXIII. KNOWN VS. UNKNOWN SERIES

	Kn.	*Unk.*	*Kn.*	*Unk.*			
	Known old sure vs. *Unknown old sure*						
Jo	29	22	1.96	1.87	Kn .09	.111	.81
Kj	16	8	4.84	5.45	Unk .61	.52	1.1
V	13	12	1.24	1.18	Kn .06	.2	.3
	Old doubtful Known vs. *Old doubtful Unknown*						
Kj	14	6	6	5.45	Kn .55	.57	.9
	Known New Sure vs. *Unknown New Sure*						
Jo	30	17	1.95	2.13	Unk .18	.15	1.2

There are no significant differences, as no difference in the averages exceeds 4.5 times the probable error of the difference of means. On the other hand we note that such differences as exist tend to show that new judgments are slower than old and doubtful judgments slower than sure. It is probable that more significant variations could be found with a more delicate means of timing.

V. EXPERIMENTAL SERIES III "SELECTION METHOD"

(1) Technique

The purpose of this experiment was to see what factors are operative in the selection of an old object from among a number of new ones. When there are a number of possibilities, how do we proceed to pick out the old individual? The technique was the same as that used in series I, except that at the time of the second presentation the first member only of each of the old pairs was exposed. After five seconds the shutter was closed and ten individuals, one of which was the second member of the pair in question, were laid out in front of the subject. The task was to pick out the old individual which the subject knew to be present. Questions were then asked as to what took place during the process of decision.

The subjects used in this experiment were P. and A. (Miss Abbott).

Quantitative Results.—P. selected the correct individual in 23 (77 per cent) cases out of 30, and A. in 11 (64 per cent) out of 17. It is thus obvious that the subjects were generally able to pick out the old individual among the new, although the chances were one in ten.

Method of Work.—Except in five cases with P. and two with A., the problem reduces, so far as the introspecting subject is concerned, to the sensory recognition of one of the ten possibilities. Whatever value the presentation of the initial member of the old pair may have as an aid in picking out the correct individual, this influence is not one that the subject is aware of. Consciously he proceeds as he would if we omitted the first part of the work and laid down ten individuals before him with the instructions that he should indicate which one of them had been seen before. This means that we are here concerned, not with the question as to whether the relationship of the initial indi-

vidual and any specific one of the ten possibilities is old or new, but whether the relations between the elements of the specified stimulus are old or new. Our elements are not the two members of a pair but rather the constituent parts of the individuals presented as possibilities. The question is, did the subject see the letters B-E-M together, etc.? With colors even this relation seems to be lacking and the issue becomes, Was a yellowish green related to past experience? Here the subject-object relation, always implicit, becomes explicit and appears to be the only relation involved.

There were, however, six instances in which the idea of the second member of the pair was recalled when the initial individual was re-presented. When the ten alternatives were laid down, this one was then picked out. All of these judgments were correct. It might be asked what reason the subject had for accepting the suggested idea. The answer seems to be that the mere fact that it was called to mind by the presented stimulus guaranteed that its percept had in the past accompanied the former. We have previously had occasion to refer to the fact that the arousing of an associate will, with many subjects, bring about its acceptance. The position is here substantiated by the fact that there were no cases in which a single possibility was suggested and subsequently rejected. This matter was specifically brought out in the reports. Once also P. said that he associated the initial member of the pair with a syllable possessing a certain type of auditory quality. When the ten alternatives were subsequently presented, he worked over them all until he found the one which came the nearest to possessing the auditory quality anticipated, and then accepted it. The decision was correct. In conclusion we may lay down the following rule. The presented stimulus (the first member of the pair) either arouses no idea of what accompanied it in the past, or that which is suggested is considered a valid product of memory. In the former case the problem, so far as the subject's conscious procedure is concerned, becomes that of recognizing one of the ten possibilities.

(2) Cases where there was Conflict

We include under this head the cases where a real question arose as to which of two or more of the presented alternatives was the old stimulus. These were, of course, the instances in which we were particularly interested in this experimental series. It gives us a chance to observe the basis for judgment when doubt is present. There were five such judgments with A. and eleven with P.

Action of the Attention.—The general rule seems to be that the attention slides over the rejected individuals, giving no heed to them, but is attracted to or "snagged on," if we may use the term, the content which presents itself as a possibility. There are two possible interpretations of this phenomenon. On the one hand, the action of the attention may be regarded as being a result of the instructions and of the fact that the possible old character of the selected individual is distinctly felt. The attention is held because the content may be old and the old individual is the center of interest in virtue of the "Aufgabe." If this explanation is correct the attention should be attracted to the content only when the latter has presented itself as a possibility. Previous to its isolation on this ground, the attention should go from one individual to another, judging it old or new as the case may be. We should have each individual taken up in order, and then the possibilities should hold the interest for a relatively long time. This statement may seem to overlook the fact that the subject may immediately pick out the individuals which may be old, ignoring the rest. It is conceivable that the former stands out of the lot to meet him, so to speak. Many of the recognitions (or possibilities of recognition) are, however, due to associations and visual images. It is difficult to understand how these could put in an appearance during the first cursory sweep of the eyes over the alternatives presented, and hence attract the attention to the content with which they are concerned. It would appear rather that they should come in when the attention is specifically held on the content in question. The felt possibility of recognition should arise under these circumstances

only after the individual has become the center of interest. Now the fact is that the rejected individuals are never attended to at all. They are for all practical purposes non-existent. Does this not seem to indicate that the attention is attracted to the possible individuals immediately on presentation and that this very prominence in the focus makes the subject consider it possible that the objects are old and familiar? Bourdon has mentioned that content which is interesting and attracts the attention tends to be recognized. We believe that he is right and that the ability to attract the attention is the first step in the recognitive process. What can assert itself in the focus is considered as very likely to be old.

Associations.—A. reported one instance in which one of the two possibilities aroused an associate and was accepted. Twice besides associates appeared, but they were so general that they applied to both alternatives equally well, and hence had no influence on the final choice. P. accepted five individuals which aroused associates more immediately and spontaneously than did those which were rejected. Four of the judgments were correct. Once the stimulus fitted in better with certain anticipatory qualifications. This has already been referred to (method of work). In another case, the individual chosen fitted the verbal description incorporated into the association better than did the rejected content. Finally, in one instance, there was no difference in the immediacy of appearance of associates mentioned, but the name which was the first associate aroused by the accepted stimulus was followed by a train of ideas, while naming was the sum total of the process accompanying the other individual. The decision was correct.

Visual Images.—A. and P. both employed visual images as criteria. The former classed two visual images of themselves aroused by alternatives as artifacts, leading to the acceptance of the other possibility. One of the decisions was correct. The following are the peculiarities which A. reported as differentiating an artifact from an image considered to represent the past.

(1) Artifacts are always imaged on a background which has sharp outlines separating it from the surrounding space. Ac-

cepted images, on the other hand, appear with backgrounds which fade off into the rest of space. (2) Accepted images are good and gray (the only images obtained were of letters, geometric forms and syllables, never colors),—while the artifacts were characterized by being washed out, or as A. put it, by the presence of non-colored letters. (3) Artifacts are located nearer in space than are the accepted images. Altogether, as A. put it, it is much the difference between a sign-board and a normal percept. In a third case, there seems to have been no difference between the images of the different alternatives. The decision was very doubtful. We shall, in the remainder of the work, classify such judgments characterized by doubt and the absence of any observable introspective criteria, under the heading E.

We found four instances with P. where the accepted alternative called forth a visual image of itself and the rejected one did not. All the decisions were correct. Once the image of a gray was not specific enough to mediate a decision between two shades, verbal description being the deciding factor. In two cases there were images of both alternatives and no difference could be discovered between them. One of the decisions was the result of the immediacy of an association; the other was of the type E, and was incorrect. We may then say that whenever there is a conflict and one of the alternatives arouses a visual image while the other does not, P. accepts the former. Where there is an image with each of the alternatives, and no difference of any type is detected, the decision is either rendered on other grounds, or, these failing, is doubtful and probably erroneous.

Motor Phenomena.—A. mentioned a case where a number of alternatives aroused an impulse to reach out and pick them up. She accepted the one with which the strongest motor reaction was correlated, which resulted in an error. This is a type of criterion we have never met before. It will receive more notice later.

There remain three judgments returned by P. all of which belong to the type E.

Other factors.—We were unable to find any other differences in the content accompanying the accepted and rejected alternatives. Of especial interest there are the reports of subject P., who

reiterated over and again that his recognition consisted in the consciousness that he had experienced the content before, and had nothing whatsoever to do with a feeling of familiarity. Our results in this series confirm those gained earlier in regard to the irrelevance of organic sensations, affective processes, etc., as far as the phenomenon of recognition is concerned.

(3) Cases where there was no Conflict

There were, in addition to the judgments where the subject was doubtful as to which of two or more of the alternatives was really the old individual, a large number of cases where the subject never considered more than one individual as a possibility. It might be that he was far from sure that this choice was correct, but the doubt never led him to work with any other specific stimulus. P. reported 19 (63 per cent of all) such judgments and A. 12 (70 per cent). These decisions add but little to what we have already observed and we will give them but short notice.

Associations.—The general rule is that associates appear only with accepted individuals. This happened in five instances with subject A. All the judgments were correct. P. reported that, with one exception, every accepted individual aroused associates, and that one rejected stimulus did the same. In contrast to his procedure in Experimental Series I, P. never named any colors or geometric forms except those which he judged to be old. This difference in the two results is easily understood, however, when we consider the difference in the conditions of work. In experiment I, each pair is the subject of an overt judgment. This means that the attention is voluntarily focused on each group. The natural result is to increase the chances that any more or less habitual reactions, like the naming of colors and forms, will be set up. The latter were therefore regarded with suspicion, a highly reflective way of stating the matter, as being possible products of the existing situation. Under the present conditions, the matter is entirely different. The instructions themselves do not bring it about that each individual is a point on which the attention is required to dwell in an explicit manner. Consequently when the attention is held up by the fact that a certain stimulus has been

named, the subject will have more reason to believe that this latter is due to a tendency established at an earlier period and will accept the implication. That there is still, however, a certain amount of wariness in the matter is indicated by the fact that P. never considered a circle, which he had named, as likely to be the old individual. The thing is too absolutely habitual to gain any credence.

Visual Images.—Accepted individuals were the only ones which were accompanied by visual images of themselves. P. reported four cases and A. six where the latter were present. A. judged old four individuals on this basis alone, while with P. there were always associations present in addition.

Motor Phenomena.—A. said that two recognitions were due to an immediate impulse to reach out and pick up the accepted individual. One decision was correct. We have already mentioned the fact that this is a novel criterion which we have not encountered in our previous work.

Other Factors.—No other factors were isolated as of any importance. We could at no time isolate a feeling of familiarity.

Classes of Judgments.

	Cases with conflicts						*Cases without conflicts*				
Subject	A^1	A^2	B^1	B^2	E	*Subject*	A_1	A_2	B_1	B_2	E
P			2	6	3	P		10	1	6	1
A			1	3	1	A	1	8		2	1

(4) Conclusions

As a result of experimental series III we reach the following conclusions:

1) Where the conditions are not such as to bring about the voluntary concentration of attention on every individual object, the only items attended to are those which are accepted or those which are considered as candidates for acceptance. This is not due merely to the fact that the "Aufgabe" is to pick out the old unit, as that would only account for the prolongation of the attention on an individual after it has once come to be considered as possibly old. It would not explain why *all* the different individuals themselves are not centers of interest requiring each a judgment of novelty or oldness. It does not explain the sweep-

ing of the attention over them without taking any note whatsoever of their status. We believe hence that whatever attracts the attention tends to be recognized, and that this ability to assert itself in the focus is the first step in the recognition of any object.

2) In cases where there is no conflict we find that the only content arousing either associates or visual images or motor reactions is that judged old. The other content has no such effect. Where conflicts occur we find that the alternatives which are considered as possible may arouse associates, visual images or motor reactions. The basis for decision in the case of conflict may be 1) the presence in the one case of an associate while in the other it is lacking, 2) the same for visual images, 3) the immediacy vs. delay of associates, 4) the arousing of a train of subsequent associations by the initial idea as vs. the failure to do so, 5) the peculiar character of the visual image aroused (artifact), and 6) the relative strength of the motor reaction set off. It is obvious without detailed statement that these are all capable of being brought into relationship with one another by being classified as manifestations of the working of the principle of habit.

VI. EXPERIMENTAL SERIES IV VOLUNTARY RECALL AND PROMPTING METHOD

(1) Technique

In the previous series we presented a number of alternatives to the subject and asked him to pick out the old individual. In the present work we were interested in seeing what were the factors involved in recognizing content which the subject has himself voluntarily recalled without assistance. The problem may be well illustrated by the question, "When I try to remember a man's name what guarantee do I require of any possibility that presents itself before I accept it as the content desired?"

We also wanted to see what effect would be produced by increasing the articulatory processes if possible. Heretofore the stimulus had always been given visually and the subject used whatever imagery he desired in apperceiving the content. Though we have noted the presence of articulatory imagery in a large number of cases, it has been of value on its own account only with H(rhythm), and then only in isolated instances. Otherwise it has merely served as the carrier of meaning with the associates. It now becomes a question whether there are any peculiarities of the process itself which can serve as a basis for differentiation in a manner analogous to the stability of visual images.

In order to test these points we employed the following technique. A series of names of battles or treaties chosen with a view to their obscure and unusual character were read aloud to the subject together with the corresponding dates. Each series consisted of six such units. The names were read one at a time with the appropriate date in the tempo of about four seconds for each. After each pair the subject repeated aloud the name and date. Following the lapse of about two minutes after the completion of the series the experimenter picked out one of the names from the list, being careful to vary the position of the one

chosen in the different series, articulated it aloud, and asked the subject to give the corresponding date. If the subject found a date that he would accept, he reported it and careful introspections were taken. If the subject could find no date which he would accept, he reported this fact to the experimenter and the latter then suggested two possibilities, one of which was correct. These also were given auditorily. The subject knew that one of the alternatives was what he was looking for and made a choice between them. Careful introspection were then taken concerning the mental processes involved in the decisions. Two dates from any one list were the maximum used in a test.

There is one point that should be noted here. Inasmuch as the interval between the initial series and the test was short (it had to be as the problem was difficult) we might expect to find what we called the carrying over of the past by the percept itself oftener in this experiment than in the first one. The result of this may not be a judgment of the A1 type, where the accepted content is perceived immediately and surely as something that has been experienced before, the sensory material itself arousing the meaning without the intervention of any ideational criteria. Rather we might anticipate that there would be an initial bias, an initial inclination in one direction or the other which necessitates further testing before the judgment is finally decided upon. This inclination would differ from that reported in series I in the greater degree of subjective surety accompanying it and in the fact that it normally influences the subject to the correct decision. We found that our anticipations were correct.

The questions asked the subject during the course of the introspection were as follows: (In case the subject was able to find a satisfactory answer without having the alternatives presented by the experimenter.)

Is this the only possibility that presents itself, or do you select this from among two or more alternatives? In what imagery terms does the date appear?

(In case there was only one possibility.)

Were there any associates aroused by the name of the battle which were instrumental in determining the date? Or was the

date when it suggested itself accompanied by associates, or followed by them?

Did you get a visual image of the date? If so, was it clear and distinct (outline or Schärfe), stable (in space), permanent (as opposed to fleeting), detailed? Were there any other factors of note here?

Did you articulate the date? Was there anything notable about the articulatory process? Did the attention once focused on the process run over the whole series of digits at one swoop without any interruption or was it held upon or attracted to any specific digit as you articulated it? After the articulation was once started (which of course involves a certain amount of initial voluntary control), did the series of digits run off more or less automatically one unit following the other without any hesitation, or is there need of more or less voluntary guiding during the whole articulatory process? Are there digits the saying of which interrupts the spontaneous flow of the articulation, involving a certain amount of readjustment before you continue?

(The latter was illustrated by the example of reading Greek words.)

Are there any motor phenomena which appear when the date comes to mind, a motor clinch, etc.?

Is there any mood or affective tone present, or are there any organic sensations to be noted?

(In the cases where there were alternatives.)

Are you sure of your choice? Which alternative came first? Which was more spontaneous (involved less voluntary search and manipulation)? In case there was a visual image, was there any difference in the assertiveness of the images? Did one keep tending to force its way into the focus of attention? Was there any difference in the assertiveness of the ideas themselves? Did one tend to keep recurring to you even when you were not looking for it, or even when you were interested in another possibility? The other questions given above were also included in this introspection.

The subjects used in this experiment were Bi. (Mr. Bickle), and Wy. (Mr. Wylie).

(2) Cases Without Prompting

Bi. returned fifteen judgments (36 per cent of all) without prompting. Of these, 53 per cent were correct. Wy. did the same in 20 cases (71 per cent of all). Of these, only 20 per cent were correct. There is thus no rule that can be laid down. The necessity for external aid seems to vary from individual to individual.

Bi. reported that only one possibility occurred to him in nine instances where he recalled the date in question without aid and the same thing was noted by Wy. eleven times. Under these conditions we say that there was no conflict.

Cases with No Conflict.—We find the following are the ways in which dates appeared:

1) *Visual Images.*—With Bi. the name of the battle aroused a visual image of the date. These images might be vague and fleeting, but provided there was no alternative, they were accepted as valid. There were seven such images aroused. In four cases they appeared in a definite place in a visual schema representing the series of six dates and battles. Twice doubt attended the judgment. We are here able to point out the reason for this, as in both instances the image was delayed. That this was the trouble was shown by the fact that with one date two of the four digits came immediately and were accepted without hesitation, while the two delayed digits were questioned. In addition, it should be noted that these are the only incorrect judgments. The remaining images came immediately or practically so (one case).

2. *Auditory-Articulatory Imagery.*—Bi. often heard the dates pronounced and in addition words indicating the locus of the particular item in question in the initial series were heard in three instances. Two of these decisions were those returned when no visual image was present. Articulatory imagery accompanied the auditory on occasion. Once only, however, was the articulation characterized by any notable property. This occurred with a doubtful judgment in describing which Bi. said that the last two digits did not run off automatically, but that

hesitation was noticeable at this point, which called for a volitional thrust to bring the process to a close.

With Wy. the date appeared immediately in auditory-articulatory imagery. In one instance, owing to great delay in its appearance, a date was rejected. Once Bi. also rejected the only alternative that offered itself. The date that put in an appearance was recognized to be one that had been concerned with the pair just preceding. We may say then, in conclusion, that provided no alternative is present, whatever suggests itself as a solution of a specific problem of memory is accepted by these two subjects, unless (1) it is too delayed in its appearance, or (2) it brings with it a definite reference to a different series. These latter conditions vary for the different subjects.

Cases where there was conflict.—There were six such judgments with subject Bi., and nine with Wy. The following are the factors that stand out as differentiating the accepted from the rejected content.

1. *Primacy in Time.*—This was used by subject Wy. In six cases, the first suggestion was accepted. There were in addition to the nine cases mentioned above, two where no decision was arrived at in regard to the alternative. In both of these, then, primacy in time is not sufficient to bring about the acceptance of one of the alternatives. Still, in 75 per cent of all the instances reported, the first suggestion is accepted, other things being equal.

2. *Associates.*—Twice the first suggestion was not accepted owing to the fact that the later date brought with it a train of associated ideas, which the former lacked. Both of these decisions were reported by Wy.

3. *Persistence.*—On one occasion Wy. accepted the date which kept forcing itself into the focus of attention in lieu of the initial possibility.

4. *Characteristics of the Visual Image.*—With Bi., three visual images of the accepted date came placed in the schema of the whole series while those of two of the rejected alternatives did not. In two of these cases, the accepted image was clearer (better outline, less vague), more permanent (not so fleeting), and

in one of them the figure appeared in more bold faced type. No visual image of the third rejected individual came at all. These last named peculiarities seem to have been of value, but the main point appears to have been the presence or absence of the associated image, the schema. Both of the alternatives were incorrect in two of these instances; in the third the right date was erroneously rejected. On one occasion, both the alternatives placed themselves in the visual schema of the old series. The more assertive individual was selected. It was the one which, as Bi. said, kept "recurring." The other image did not possess this property to such a marked degree.

5. *Ease of articulation.*—Twice Wy. accepted the date the articulation of which was the more automatic.

We note in addition that Wy's reports indicate the following differences between doubtful and sure judgments of old. Whatever content presents itself immediately and without effort is, other things being equal, accepted without hesitation, while when delay and a period of voluntary effort is involved in reviving dates, the later are regarded with doubt, even if accepted. Bi. had to choose between two alternatives on two other occasions. Once the first possibility that appeared brought with it an association with a different battle, and hence was judged wrong, the second date being accepted. In the second case, Bi. said that he had been thinking of the date in question before it was called for, and hence the alternatives were of no use. These are strictly speaking not conflicts. The matter never comes to a real issue. There were only two correct judgments with each subject. This was due to the fact that both alternatives were often incorrect.

(3) Cases With Prompting

Often the subjects could not come to any conclusion in the matter of the date required without being prompted. Sometimes this was due to the fact that no dates at all appeared, excepting maybe isolated digits, such as the century in question, but not the exact year. At other times the subject was unable to find any grounds for deciding between two possible alternatives that presented themselves. Under these conditions the experimenter of-

fered two possibilities in the manner indicated above. Bi. received assistance in this way twenty-seven times making twenty-five correct decisions. Eight of Wy's judgments were of this type, seven of them being correct.

Initial Inclination.—Owing to the short interval between stimulus and test, there was a tendency for Bi. to conceive a preference for one of the alternatives immediately when the experimenter articulated it. This occurred in nineteen of the twenty-seven instances. Only four of these judgments, though, were of the type A1, *i.e.,* so certain that no appeal to reflective criteria was necessary. This is extremely interesting, as we seem to have here transition cases. The past is not so completely incorporated, so to speak, into the present that the meaning—the reference—is called out in an ultimate manner by the static and unyielding sensational content itself, nor is it so completely obliterated that the subject is forced to rely entirely on the imaginal and reflective criteria. There is rather a tendency to perceive the content as old immediately, but it is not strong enough so that Bi. foregoes the appeal to further evidence. It is furthermore to be noted that the reflective stage of the decision never changed the decision for the worse. Once it even forced the acceptance of the date which was initially the more unfamiliar. The decision was correct.

The following criteria were appealed to:

Anticipatory Images.—In three cases, Bi. had been working with material before the alternatives were suggested. When the latter occurred, he found that one of the two offered corresponded in part with some of the details (the century) that he had already worked out, and in consequence accepted it. Wy. reported the same phenomena once. Three of these four judgments were correct.

Difference in the Articulatory Processes.—Eight of Bi.'s decisions resulted from the fact that the articulation of the accepted alternative was the more automatic, no hesitancy being noticed in the saying of any of the digits. Bi. used such terms as: "It runs more glibly." "There is no hitch before the last digit." "The attention does not guide the process continuously, there

is no voluntary push in order to complete the number." It is obvious, of course, that the repetition of the two alternatives, one after the other, is a highly reflective process and hence the appeal to this mode of decision always involves volitional factors. The difference seems to be that in the one case the articulation runs off in an automatic and easy way, the sequence of laryngeal movements being unguided, while in the other, the volitional factor persists throughout the whole process, each successive digit being felt as a distinctive individual, not as a mere continuation of a process already under way. Wy. appealed to this same criterion four times. In addition to the description given by Bi., the former said that it was less of a volitional matter to start the flow of auditory imagery of the date with the accepted content and that it was easier to turn from the image of the new to the old than vice versa, *i.e.*, the mental inertia to be overcome was greater in one case than in the other. All of the judgments returned by Bi. and three of those with Wy. were correct.

Visual Images.—These were employed by Bi., never by Wy. The following characteristics of the images were used as a means of differentiating the old and the new.

1. Greater Permanence. By this we understood the tendency of an image to maintain itself for a relatively long period of time, as opposed to a fleeting character or a tendency to fade out and disappear quickly. Four decisions were due to the selecting of the date arousing a more permanent image of itself; they were all correct.

2. Completeness. By this, we understood the character of an image as detailed and filled out in respect to the different items that one would expect to find in the percept of figures, as opposed to a scrappy, incomplete content. There were four cases where the accepted image was more complete.

3. Place in the Schema. On four occasions the image of the accepted date appeared placed in a schematic representation of the series or column of names and figures which Bi. built up at the time when the stimulus was given the first time. The rejected images were not so placed. The judgments were correct.

4. Persistency. By this we mean the greater tendency for one image to usurp the focus of attention. It will return persistently, without being sought, while the other image will not. This was used as a criterion twice. One judgment was correct. As Bi. put it, "the one returns on its own account, the other only when I go after it."

5. Associations. An association mediated one decision returned by Wy. Once Bi. rejected an alternative because he said that as it represented a number possessed of peculiar mathematical properties, he would have recalled it himself if it had been a member of the initial series.

6. *Auditory Quality.* In one case Bi. tried to hear the two dates articulated in the voice of the experimenter. He accepted the one with which he succeeded, which was correct.

We can thus account for all but five of Bi's judgments and for all but two of these returned by Wy. Of the former, four were decisions of the class A1 and one of the class E. Both of the Wy.'s reports were of the class A1.

(4) Conclusion

We find that: 1. In a good proportion of the tests both subjects recall the dates themselves. With one exception where a long interval intervened before anything suggested itself, a date is accepted provided there is no conflict. The mere ability to arouse a definite idea in the case of a problem where we are trying to recall terms, will be the basis for regarding it as correct. If alternatives are called up, we find that the subjects employ different criteria. With Bi., the decision is based on (1) the relative assertiveness of the visual images; (2) the ability to arouse associated images representing the original situation, *viz.*, the schematism. Wy. selects the first, the more persistent, and that which arouses associates. Ease of articulation also plays a part with both. These peculiarities are, of course, easily subsumed under the concept of habit. The first thing that we think of is usually the most habitual. The habitual reaction tends to assert itself, and the arousal of associates, or of a visual setting, is the result of overflow into preformed pathways.

2. If no possibility suggests itself or if there are no differences on the basis of which the subject can decide, he must look for outside help. Different subjects then appeal to different criteria in deciding between suggestions offered. Some criteria are common, however, to both Bi. and Wy. Of this type are ease of articulatory sequence, anticipatory images and the relations of associates. Bi. employed in addition the relative completeness, permanency, and persistency of the visual images, their ability to bring associates (schema), and also the ability to reinstate a highly familiar auditory quality with one of the alternatives. It is of course perfectly obvious that these also can be subsumed under the principle of habit.

3. We have also noted that by shortening the interval we are enabled to find transition cases between the judgments mediated by the percept, of the type A1, and those where whatever inclination is present at first is no better than a mere guess (Jo. in series I). We have, of course, already admitted that our concepts may not have been adequate to isolate criteria (other than the percept) which were actually operative in determining the A1 judgments. On the other hand, we have given certain reasons for believing that we have under these conditions decisions which are due to perceptual criteria. The intermediate cases noted in the present experiment when the interval is relatively short indicate that there is a gradation in the strength with which the past can assert itself through the stimulus alone. Starting from judgments of the type A1 which are perceptually mediated, certain, and reliable, we descent through the judgments where the initial inclination is usually correct but is not accepted as final, to those where the initial inclination is a mere guess (see Jo. series I). These latter always necessitate a reflective testing. We have already pointed out that the intervals employed by many previous experimenters have been exceedingly short. It appears to us that in the light of our conclusions they were by this very fact prohibited from seeing the whole range of the recognitive reaction, and as has been said before, from taking note of the criteria appealed to in case of doubt. They were really dealing with A1 decisions a good part of the time.

VII. EXPERIMENTAL SERIES V. OPPORTUNITY FOR INTELLECTUAL ANALYSIS LIMITED. EFFECT OF CONGRUITY WITH CONTENT

(1) Technique

The object of this experiment was to determine two points: 1) When no opportunity to work over the material in a highly reflective manner is afforded, what criteria are present, at the time of the report, with the content which the subject believes that he perceived. In other words, what characterizes the conscious processes involved when the subject recalls such material immediately following its presentation?

2) What influence, if any, does the presence of congruity with a larger context have in determining what will be accepted?

Method. We used an ordinary fall tachistoscope, employing as stimuli cards on which were groups of typewritten words. The number of words varied from three to five on the different cards. Sometimes the former were arranged so as to make sentences, while at other times there was a number of unconnected words. The cards of both types were mixed in the order of their presentation, so that the subjects had no knowledge of what to expect. The subject sat in front of the tachistoscope and fixated a point over the place where the middle of the group of words would appear. The experimenter gave a warning, counted three aloud, and released the shutter. (The time of exposure was about 1/10 sec., being the normal exposure used in tachistoscopic work.) The subject then reported what he had seen, and introspections were taken. The questions were practically the same as those employed in Series IV, except that the matter of articulation received less attention unless the subject indicated that it was of importance.

In this way we were able to achieve the conditions that we were interested in. The subject had no time while the shutter was going down to indulge in intellectual analysis and the two

kinds of material gave us light on the influence of context. On the other hand it is worthy of note that under these conditions we are not, strictly speaking, dealing with the phenomenon of recall or memory. For if we accept James' doctrine that memory always implies a period intervening between perception and recall, during which the stimulus is not an object of thought, the present series returns no instance of memory. The subject is constantly concerned with what he saw from the moment the shutter falls to the moment when he makes his report. Inasmuch, though, as this report is made after the stimulus has been removed, and hence refers to a past content of consciousness it must throw light on the processes involved in deciding what has been experienced at an earlier time under conditions which preclude a period of mental manipulation. In this sense, then we shall speak of the process here investigated as recall. In ordinary life we find the counterpart of this situation whenever owing to any cause whatsoever we are called upon to decide what we perceived in the course of a brief and hasty survey. Finally, we see no reason to believe that whatever influence of context is demonstrated may not be considered to hold good even where we have genuine recall. There would be no difference in the conditions that should alter our general results. Our interest in this part of the investigation was entirely different from that actuating the work that has been done so thoroughly at different times with the same technique. The interest generally lies in the question of what influence context has on the scope of attention, on the number of items correctly or incorrectly perceived. We are not here concerned with the quantitative side but rather with the question as to what influence context exerts in leading to the acceptance of ideas which memory throws up as being representations of the past.

The following report refers to all the content reported as perceived, both that which at the time of the fall of the slide stood out clearly in the focus of attention and that which was but vaguely cognized as lying in the fringe. Both types of material are at the time of the report referred to the past. For any one interested in differentiating between the two, we call attention

to the fact that all cases of rejection, conflict, and a highly doubtful character are to be grouped with the content but vaguely perceived.

(2) Non-Consecutive Material

The subjects used in this experiment were A. and S. (Dr. Sutherland). In thirty-seven cases the material did not form sentences with A. and in thirty-six with S. It is impossible to give anything like a fair quantitative report of the number of correct and incorrect items returned, as in many cases only individual letters were mentioned, in others complete words and in still others a number of letters of a word, some of which were correct and some incorrect. We shall then, in these reports, deal almost exclusively with the introspective data, and where we speak in quantitative terms at all the unit will be the card.

Cases with No Conflicts.—In twenty-four instances, A. reported that she accepted whatever suggested itself without questioning. The same thing was true of thirty of the judgments given by S.

1. Mode of Appearance. A reported that the letters and words returned were all articulated immediately and spontaneously as the shutter fell or just after it. Once when this did not take place, there was a tendency to articulation reported, and on two other occasions grave doubts were expressed as to the validity of the replies, as even this immediate tendency was lacking. The delay in articulation will, then, lead to doubt as to the value of the judgment. A visual image was present in all but six cases. In four of these the articulation came immediately, while in the other two it did not. We see that while the failure to articulate immediately leads the subject to doubt the validity of his reply, the absence of a visual image has no such effect. On the other hand, certain properties of the visual images distinguish the doubtful from the sure reports. Where the background on which the letters appeared was a good white one, and the letters themselves were a clear gray and sharply outlined, not tending to fade into the background, A. felt pretty

sure that the content in question had been on the card. Where, on the other hand, the background was gray and the letters less sharply outlined and clean cut, there was more or less doubt. This seems to have been a basis for distinguishing the two classes of judgments, the doubtful and the sure, but it was never a basis for the rejection of any possibilities that offered themselves.

With S. the procedure was entirely different. Often the word suggested was present as a good clear visual image as soon as the shutter had fallen. These images were, as S. put it, continuous with the percept. As soon as the stimulus was removed by the shutter, the image was just there with clear outlines and complete details. Under these conditions, S. was sure that he had made no error. (These were the words clearly perceived as the shutter went down.) On the other hand, it often happened that S. had merely a blur for a visual image. Sometimes there were isolated letters which could be made out in this blur while at other times even these were lacking. Later the blur would "clear up into" a word. These words were reported but were regarded as being more open to doubt than the others. Especially if the clearing up process was delayed, was S. inclined to look at the result askance. Another source of doubt was the lack of a clear outline of the letters in an image.

Cases Where the Only Suggestion was Rejected.—On occasion, A. and S. both rejected as invalid the only suggestion that appeared. This was noted six times with A. and twice with S. (These are all words which were not distinctly perceived at the time of exposure.) The following were the peculiarities of content found to accompany these judgments:

Construct Character of the Visual Image. We have already mentioned the fact in connection with Series III, that A. regarded certain visual images characterized by definite peculiarities as being products of the present moment and not re-presentations of the past percept. We shall not go into the matter any further at this point (see Series III). Twice the only possibility that appeared was refused credence on this basis.

Length of the Visual Image. A. and S. each rejected an individual owing to the fact that it was too short for the image

of a very blurred character which was carried over from the percept.

Delay in Articulation. With A. on three occasions, no word or letter was articulated promptly and spontaneously as the shutter went down or just following it. We have found that this occurred twice before and both times we noted a strong element of doubt. We may then say that if no possibility suggests itself in articulatory terms, if the subject does not immediately read, so to speak, something to herself, the content that comes up later is very likely to be rejected and at least will be looked at askance. These judgments were all correct.

Fleeting character of the Visual Image. S. rejected an individual the visual image of which faded out immediately, an unusual occurrence.

Cases of Conflict.—A reported seven cases of conflict, in five of which a decision was possible. S. reported four such instances and reached a decision three times. The following were the criteria appealed to: 1. Completeness of the visual image. A said that once a complete visual image of one of the alternatives appeared, while the other image showed only a number of letters. The former was correctly accepted. 2. Lack of Background. A. rejected a word that had no background, while the accepted individual was on a good white one of the type already mentioned. A difference also in the assertiveness of the images was reported, the accepted one tending to recur of its own accord. We have already mentioned the use of this mode of distinguishing between the old content and the new. The decision was wrong, leading to the rejection of the correct alternative. 3. Context. A. and S. each gave the preference to an alternative which fitted in better with the meanings of the other words than did the second suggestion. 4. Relative Assertiveness of Visual Image. Twice S. accepted the more assertive image. 5. Length of Visual Blur. An alternative which was of approximately the same length as the blur which came up in the visual image was judged old by A. 6. Clearness of Visual Image. In one case the image of the accepted individual was clearer than was the other image. (This is not the so-called attributive clearness to

which the structuralists would reduce attention, but is rather a matter of the clearness of the outlines and details involved, as opposed to a blurred character and obliteration of detail.) The decision was correct.

We conclude then as follows: In agreement with the results obtained in Series IV, we find that all possibilities that suggest themselves are accepted, provided they come promptly and without effort, and provided they do not conflict with certain positive characteristics of the visual image, and provided no alternatives appear. Where the latter occurs, different criteria are appealed to by the two subjects, although some overlap. It will be seen, however, without a detailed statement that these criteria are such as may easily be subsumed under the principle of habit. We conclude, then, that the same rules hold for material which the subject has no opportunity to work over in a reflective manner as for that which he has manipulated. This will, it appears to me, invalidate many conclusions drawn on the basis of experiments utilizing distractions.

(3) Consecutive Material

A. reported thirty-eight such judgments and S. thirty-seven.

Cases with No Conflicts.—In thirty-two cases, A accepted whatever suggested itself without questioning. This tendency is thus stronger where we are dealing with material that forms a meaningful whole, where, *i.e.,* each unit is related to every other one by means of threads of meaning, than where we have a series of individuals which are unrelated. (86 per cent vs. 65 per cent.) The content may come in the shape of a visual image or of immediate and spontaneous articulation of the words in question. There seems, however, to be no basis for differentiating acceptable material from that which is not considered correct on this basis. Content was rejected only once and in this instance A. said that it might have been there. The trouble seems to have been that this sentence was rather long and A. was sure that she had not seen it all clearly. Moreover, the part rejected did not appear in a visual image. This, while it will not hinder content from being accepted, will nevertheless cause

it to be regarded with questioning. Certain factors led the subject to regard suggestions with a certain amount of questioning even if they did not lead to rejection. Among them we note (1) lack of visual image of the content concerned; (2) a gray background (as before); (3) lack of a clean-cut outline of the letters in the visual image; (4) scrappy character of the visual image; (5) delay in the articulation, (which really means in the appearance, the coming to mind of the content); (6) tendency to fade out quickly on the part of the image.

In contrast to subject A.'s reports, we find with S. that the proportion of instances in which the content is accepted and no conflicts appear is smaller when the stimuli form sentences than when they do not. This then appears to be a matter that varies with the individual, but while this effect of context is not noticeable here, another difference obtains which will be mentioned later. S. accepted the only content which presented itself in twenty-six instances. Sources of doubt were, (1) delay in the appearance of the visual image; (2) vagueness of the image; (3) the tendency of parts of the image to come and go instead of persisting steadily. All the visual images which came late and were accepted were clear. No individual was regarded as valid the image of which was both delayed and vague (blurred, outlines not sharply cut and details well marked).

Cases with No Conflicts Where the Suggestion was Rejected. S. rejected five individuals even though there was no alternative on hand. This occurred but once in A.'s reports (see above). The bases for the decisions returned by S. were: 1. Vagueness of the image *plus* delay (1 case). 2. Fleeting character of the image (2 cases); 3. Violated sense of the rest of the sentence (1 case). 4. Image too long for the initial blur (1 case). All the judgments were correct.

Cases with Conflicts.—A reported only five conflicts, as opposed to the seven with cards not giving a consecutive sentence. This then is the second point to note with her. A definite context not only tends to increase the inclination to accept whatever suggests itself but it also diminishes the likelihood of conflicting alternatives. Three choices were possible. S. reported six con-

flicts, in five of which a choice was possible. The criteria employed were: (1) Presence of a visual image of one alternative and lack of it for the other. (A) 2. Presence in the visual image of certain letters which would fit in with one alternative. (The image was incomplete). (A.) 3. The length of the visual blur that was aroused when the shutter went down and which persisted over was more compatible with one alternative than with the other. (A.). Two of these judgments were correct. 4. Better sense with the rest of the context. (S. 3 cases.) 5. More assertive character of the visual image (S. 2 cases). In three of these instances both alternatives were wrong, once the correct individual was accepted and once it was rejected. Twice with A. both of the alternatives made a meaningful sentence, while on one occasion the accepted one did. In the judgments recorded under (5), no difference in the meaningful character appears. We thus find that in all there were three cases with A. and four with S. where a direct preference for words that fitted in with the general context in meaning was evinced while we never noted a choice in favor of an alternative that violated meaning.

(4) Conclusions

We may then summarize the results of these experiments and say that context tends to dictate what will be received as old in recall either by: (1) Lessening the dissatisfaction with what appears so that fewer suggestions are rejected (when only one alternative is present) and that fewer cases of conflict occur than in the series where no meaningful whole exists, or (2) Furnishing a criterion which leads to the rejection of an individual where a meaningful alternative is present. Also (1) We find again that mere appearance is likely to lead to the acceptance of a possibility unless there is some criterion of novelty in connection with it. These criteria are all explicable as due to the law of habit. This is so obvious after what has been said in former experiments as hardly to need expansion. Even the tendency to accept what fits into the context is due to habit. For in our normal experience there is some kind of orderliness, some kind of a synthesis in meaning terms. Hence where this is lacking we conclude that the experience has not yet been subjected

to the synthetizing processes of the mind, has not been brought into relation with the other factors of the situation. In case of conflict, also, the criteria are of the same general type.

2. In general the same kinds of criteria are used with content which has not been subjected to reflective attention as with that which has been the object of more or less careful observation and thought. It would be well for all those who attempt to prove the absence of reflective criteria as a result of experiments involving distractions, etc., to note this fact.

VIII. EXPERIMENTAL SERIES VI. FURTHER WORK ON THE INFLUENCE OF CONTENT

(1) Technique

In order to test the influence of context more fully we used the following technique. Instead of writing the words one after the other and having them separated by equal spaces, as was done in the previous series, we prepared cards on which were sentences of from three to five words. The last word, however, did not make sense with the rest of the group and it was placed about half an inch to the right of the others (the unit used in measuring was a typewriter space), so that there was three times as much room between it and the preceding word as there was between any other two units. The subject did not know of the arrangement. He was told to fixate a spot over the place where the body of the content would appear. In this manner the outlying word was removed from the region of distinct perception. Still (in many trials) the presence of something at this point was noted. We hoped in this way to find out whether the subject would complete the sentence in terms that would make sense even though the stimulus did not give him reason to do so. (We consider in the following the basis for accepting any content irrespective of its place on the card.)

(2) Results and Conclusions

Cases with no alternative.—There were in all twenty-six judgments returned by subject C. Of these, ten were instances where the content that suggested itself was accepted without any conflict occurring. In all of them the accepted words and letters were articulated immediately and spontaneously as the shutter went down. Generally there was also a visual image present, either good and clear or a blur in which certain characters could be distinguished. When the latter was true, the decisions were doubtful. Subject L. worked in forty-six tests. In thirty of

these, only one alternative presented itself. These came in both articulatory and visual terms. As contrasted with the rule for subject C., the promptness with which they appeared had no influence one way or the other. The visual images present characteristics much like those reported by S. in the former series. It often happened that the image carried over after the shutter had fallen was only a blur and that L. then articulated something that suggested itself and the image cleared up. It would perhaps be better to say that the image of the content placed itself over the blur as the latter persisted underneath.

Cases with No Conflict where the Suggestion Was Rejected.—This happened five times with subject L. and nine times with subject C. The basis of the rejection was as follows: 1) the words or letters did not suggest themselves promptly (4 cases C). 2) Character of the visual blur. On three occasions, C, rejected words that were not compatible with the visual images aroused. The images represented blurs only, but in these blurs there were certain characters such as letters or spaces, that made the acceptance of the suggested word impossible. Once with subject L., the initial length of the blur precluded the suggested content. 3. When the visual image faded right back into the blur, L. gave it no credence. This occurred but once. 4. Two images were judged to be constructs, which for L. were characterized by a lighter faced type than that appearing in the images where the content was judged to represent the percept. 5. L. rejected one suggestion for the outlying member which did not make sense with the rest of the sentence. On the other hand, where a meaningful suggestion for the same position appeared in one instance, C. said that he was afraid that it might be due to the desire to make sense and as he had no visual image to assist him in the matter, he was rather skeptical. This is not, however, a bona fide rejection.

Cases Where there Were Conflicts.—C. reported eight such instances and L. eleven. The criteria used in choosing between the alternatives were: 1. Relative assertiveness of the visual images. 2. The length of the visual blur and failure to fit in with the letters that could be made out in it on the part of the rejected units and agreement with them on the part of the

accepted units. (C. and L.) 3. Visual image vs. lack of one. 4. Visual image more clear (outline or Schärfe). (L.) 5. Visual Image more permanent in time. (L.) 6. Visual construct vs. an image in the dark faced type. (L.) 7. No difference in visual image, but the first suggestion accepted (L.). 8. Associate. One case determined by the content of an associate. (C.) We note finally that L. twice judged content old in spite of the construct character of the visual images. However, no alternative in good type appeared. This peculiar character, then, seems to lead either to rejection or to doubt, and always to rejection when an alternative with a good visual image is present. It is hardly necessary to call attention to the fact so often noted that the criteria employed vary with the individual and can easily be subsumed under the principle of habit.

Cases Where the Outlying Word Was Filled In.—C. filled in the outlying word on six occasions and L. on twenty-four. Once, with C., the suggestion consisted merely in one letter which was correct. In four of the five remaining cases the word suggested made sense. One of these four was rejected as it was delayed. L. reported fourteen suggestions which made sense with the rest of the context. Two received no credence for reasons already given. We see then that in 75 per cent of the accepted words with C. and in 65 per cent with L., the context forced the appearance of meaningful or rather congruous material. When we consider that none of these judgments were correct, we can see how great is the influence of context.

Conclusion.—We find here nothing different from what we have already noted in earlier experimental series, except that we obtain strong additional proof of the fact that what we accept as a valid representation of the past is strongly influenced by its congruency with other matters which we have already come to regard as valid. This is to say that we tend to recall material which harmonizes on the meaning side with the other things that we know about the situation.

IX. EXPERIMENTAL SERIES VII. MEMORY AND IMAGINATION IMAGES

(1) Technique

The object of this experiment was to observe the differences between images of the imagination and of memory when they are aroused in response to verbal stimuli. As has already been pointed out we desired to employ a technique that would admit of the realization of the following two conditions:

1. In the material presented, we shall alter one relation at a time. The subject will have his attention clearly drawn to it, and hence will be concerned with it and not with the unaltered phases. Also the relation will be so vital and its violation so flagrant, that we shall have extreme cases of novelty. Paralleling this we shall use highly familiar content as the basis for the memory images. In this way we hoped to realize the novelty or oldness of a specific relation of two terms, which is, as we have already mentioned, the true object of a recognitive reaction.

2. We shall avoid all stock content of the imagination such as giants, etc. These are really not cases where the subject is judging that the content represents a novel experience, but rather he is conscious that it is something concerning which he has already at some previous time come to the conclusion that it is new. What we really have is the recognition of an old judgment of novelty, and not a true case of altered content.

Our method, then, was as follows. The subject was seated in front of a table, with his back to the window. The experimenter told him to assume an easy position and to visualize in any way he desired (eyes open or closed, etc.) each of the following pairs of objects or of persons, taking careful note of points of difference between the visual images as they appeared. In the early tests, the suggestion was made that the subject should visualize the two different contents alternatingly a number of times, in order to observe the differences. This was not, however,

insisted upon, and was seldom if ever done. By calling for the formation of an image of the imagination and an image of memory in immediate succession, we hoped to be able to throw any differences into the lime light.

In order to insure the presence of bona fide memory images, the stimuli were made highly specific as a general rule, though in a few cases the subject was given some latitude in his choice. This was almost necessitated by demand for variety in objects represented. The experimenter could not specify exactly in every case, for each observer, a particular individual in a given class, and had to allow the subject some free rein.

After the subject reported that he had called out images of each of the required objects or persons, introspections were taken. The following were the aspects considered:

1. Did the image come immediately on the heels of the stimulus word itself, or were there ideas and images of diverse kinds that served as introductory material?

2. How did the image come, spontaneously (without voluntary seeking and effort) or not?

3. What were the properties of the images? Were they clear and distinct (a matter of outline), detailed, stable (hold together in space), permanent (not fleeting), colored, possessed of three dimensions? Did they come as a whole or piecemeal? If the latter, did you voluntarily fill out details which were noted as missing, or did the latter suggest themselves, come spontaneously one after the other?

4. Were there any associations? Mood? Affective Tone? Organic Sensations? Peculiarities of a motor type? Did the image have a background (other than an undifferentiated grayish subjective space)? Was there movement in the image?

5. Did you find any elementary feeling of familiarity? (It was clearly explained that by this was meant an element of the structuralistic type, unanalyzable into any simpler components.) Does the image represent anything that you have experienced before?

The object of the last part of the last question was to assure the experimenter that any given image that he had intended to

function as such, really was an image of imagination. The possibility of seeing many peculiar combinations of animal forms, etc., in books, cartoons, etc., is so great that there was no a priori guarantee that the subject had not actually at some time seen a picture of the content called for by the stimulus word. By asking in every instance for a definite classification of the image by the subject it was the purpose of the experimenter to eliminate this source of error.

Emphasis was placed on the question of the presence of a feeling of familiarity. Under the present conditions, if anywhere, it ought to be noticeable. When we are dealing with sensory material the reactions of an organic nature, etc. set up by the stimulus may be so strong as to overshadow the feeling of familiarity. In a case like the present, where the attention is more specifically directed inward, we ought to be able to isolate the content in question. Moreover, the juxtaposition of the old and the new should throw the specific and peculiar tonus of each into sharp relief if any such tonus exists. The following is the list of stimuli used. It will be noted that the order in which the old and the new images were called for was different at different times. This was done in order to avoid as far as possible stereotyped procedure.

1) XX (a university hall); a horse in the lecture room. 2) Dr. Z.; Dr. M. twelve feet tall. 3) An elephant ;A camel with an elephant's trunk. 4) Two friends, one with the skin of a negro. 5) RR (a university building) standing on end; ZZ (a different building). 6) Flock of flying dogs; flock of flying geese. 7) Cat as big as XX; A dog that you know. 8) An Ithaca street car; A steamboat upside down on top of the water. 9) R (a man) on the top of a tree; A woman of your acquaintance. 10) A bunch of violets: A girl with violet colored hair. 11) A cow's head; A cat with horns. 12) Your home standing on the chimney; A certain building. 13) XXbright red; CC (another building). 14) Dr. Z.'s desk as big as this room; Your seat in the lecture hall. 15) A pair of violet colored shoes; A white dress. 16) Pansies growing in a snow bank; A flower garden of your acquaintance. 17) A mouse with a lion's head;

a rabbit. 18) A grocery store with hardware in the window; a known grocery store. 19) A tree with a red trunk; A tree. 20) Your fountain pen; A pen in the point of a dagger. 21) Your student lamp upsidedown on the table and lighted; A revolver. 22) A tree standing upright in a rowboat; Your room. 23) A horse standing on his head; A particular chair. 24) The book you were reading last night; A strawberry as big as a bushel basket. 25) The library without any tower; Your notebook.

There are, it will be noted, some instances where the subject was allowed to pick out a particular individual of a class himself. This was perfectly legitimate as we were only interested in the image and cared not how the stimulus that aroused it was defined. We employed but twenty-five pairs as the results were uniform enough to make more tests mere drudgery. Especially was it noticeable that toward the end of the series the subjects would dismiss the matter with the statement that the results were as usual.

The experiments here reported were performed at Cornell. The writer wishes to express his appreciation of the kindness and courtesy of the members of the Psychology department of that University for affording him every opportunity to complete the work started at Chicago. The subjects were Miss Curtis and Mr. Bishop, graduate students in psychology, and Mr. Boring, an instructor in the department.

(2) Results

We summarize the results as follows:

1. *Mode of entrance.* With a few exceptions, the manner in which the image came differed in the products of memory and those of the imagination. The memory images came immediately and spontaneously in response to the stimulus. As Bh. (Bishop) said, their appearance was automatic. In the case of C. and of Bh., they came as a whole; *i.e.*, they were complete in detail on arrival. This latter point is of course one that involves a rather subtle question. What do you mean by completeness of detail? Almost all images are fragmentary as compared to

percepts, and moreover there is no percept of the object present, with which we can institute a comparison to see whether anything has been omitted. Again, we cannot score the number of details present and say that one image is more complete than the other in a quantitative sense. The definition was then adopted that an image was detailed when the subject was not conscious of any missing items, the absence of which attracted his attention. Such an image was subjectively complete. In contrast to this mode of entrance of the memory image, we find that as a general rule the imagination image was built up voluntarily. The familiar constituent parts appeared at first in isolation, and the subject put them together. When it was a matter of altering the size, the subject got the content in its normal proportions at first and then proceeded to make it grow. We have a volitional process involved, the images constituted as the result of directed effort over and above that involved, of course, in the mere initial undertaking of the problem. With Bo. there was, it is true, some effort involved with memory images in filling out details which were not present at first, but this is different from the above. The point is, namely, that in the case of memory images, the subject already has a content which he feels to be in some sense adequate to the instructions and then fills in details. This does not involve persistent strain and voluntary effort, but merely a little here and there as occasion demands. In the case of the imagination, the whole matter is an effortful process and there was no quasi-adequate nucleus to work on. Rather the latter had to be built up gradually.

2. *Stability.* Another peculiarity that occurred frequently with imagination images was their lack of stability. The parts would not stay together in space, or the image tended to revert to its old proportions. C. said that there was continual effort involved in maintaining the matter in its desired status. This did not always occur. It was, however, the general rule in Bh.'s reports, it was noted in fifteen cases with C., but it was relatively rare with Bo. On the other hand, without exception memory images were stable, *i.e.*, had no tendency to disintegrate in space.

3. *Paucity of detail.* On a number of occasions with Bo.,

the imagination image came quickly and easily. Some of these images were characterized by lack of stability, as noted above. Another basis of differentiation is the paucity of detail, by which we mean felt lack of detail (as explained). This generally comes about as follows: The initial familiar content out of which the memory image is built up is fairly detailed. On subsequent manipulations, however, many of these items disappear. This reduction of content may go so far that the results are characterized as being mere blurs, or cease to bear any resemblance to what the subject is trying to call out. Bo. also declared that he was unable to restore the concreteness by voluntary manipulation.

4. *Lack of Permanency.* Bh. reported instances where the imagination image was there once and gone forever, no effort being effective in recalling it. It is undoubtedly true that memory images were not always permanent, as they often faded out quickly but they could always be revived. With Bo. all memory images stayed as long as he wanted them. They were, so to speak, voluntarily relinquished. Of one imagination image, however, the subject said that it kept disappearing against his will and that he could only recover it with difficulty.

5. *Color.* Color is a rare thing in imagination images with Bh., while almost all memory images are possessed of it. No difference in this aspect is found with the other subjects.

6. *Size.* We have a peculiar phenomenon reported by Bo. in connection with three imagination images. In two of these, parts of the novel complex were felt to be distinctly out of proportion. The head of a man was too large, etc. In the third case, where the images were of extended landscapes, the memory image required eye movement to look it over and take in different parts, while the imagination image fell, as a whole, within the field of clearest vision. It was, then, felt to be disproportionately small.

7. *Three dimensions.* Bo. reported that three imagination images were flat. All other images were in three dimensional space.

8. *Motor Phenomena.* C. reported differences in the motor

reaction set up. She often spoke of an attitude of going out towards memory images, while with the imagination images there was often an attitude in the hands and arms of forcing the images which would not stay together in space to come closer together. When the normal space relations were violated (building on end etc.), there was a feeling of twisting some part of the body.

9. *Qualitative Difference.* Twice Bh. reported what may have been a qualitative difference. The terms employed were "filmy" and "vaporous," as applied to imaginary complexes.

10. *Eye Movement.* Although this experiment was not especially designated to test the presence of eye movement, and although we are thoroughly conscious of the fact that the subject is especially liable to suffer from illusions in regard to this matter, we note a few rather interesting observations. We are perfectly aware that they are not irreproachable. Twice with imagination images C. reported eye movement, Bo. records eye movement or eye strain with all but three of the imagination images. They formed a part of the accompanying kinaesthesis. Eye movement occurred also with the memory images but somewhat less often. It carried the localizing reference, and was concerned in the exploration of the image. These results are contrary to those of Perky.

11. *Organic Sensations.* C. and Bh. reported differences in the organic sensations involved with the two types of images. C. said that the sensations accompanying the familiar images were such as were always present unless an unfamiliar stimulus introduced a complication. On a number of occasions, Bh. reported that the organic sensations were hardly noticeable at all. With Bo. we took very careful introspections on this point. In the case of memory images, the subject spoke of slight feelings of pressurelike pull, of achy, visceral sensations in the region of the diaphragm and aesophagus. These occurred also with a few imagination images when the effort was moderate. On the other hand head-and-neck strains were prominent when there was much effort.

On the basis of these statements, it appears to the experi-

menter highly probable that these organic sensations are not to be looked upon as independent peculiarities differentiating the two types of content. They are rather the results of a relatively easy arousal on the one hand and a relatively effortful process on the other. This comes out clearly in the introspections of C. and of Bo. With the former, only the imagination images, involving effort, are the occasion for the appearance of organic sensations different from those of normal life. With Bo., as we have already said, the sensations involved are given similar description, except where there is a large amount of effort present. This is easily understood. Effort and hindrance would naturally be the cause of many currents being sent down into the visceral system, and also into the muscalature of the head, neck and shoulders, such as is usually involved in attention, and this would result in a decidedly different background in the two cases.

12. *Affective tone.* The contention that affective tones of a particular type are the usual accompaniments of different kinds of images is not substantiated by our results. C. reported that normally the memory image is accompanied by pleasantness. The majority of cases of imagination were neutral, though both pleasantness and unpleasantness sometimes occur. With Bh., affective tones are an exception. When they are present, the same rule holds. With Bo., on the other hand, we found affective processes of both kinds in both types of images. (Bo. was somewhat sceptical of his ability to isolate pleasantness—unpleasantness components at any time whatsoever. As far as he ever is able to find any such elements in his consciousness, he said that the above would represent the present situation.)

13. *Associations.* Associations occurred with both memory and imagination images in the reports of C. and Bh. This seems to constitute a difference between the recognitive process on the ideational and the sensory levels. In our work with the latter, we noted that associations were accompaniments of old content as a general rule or at least that some differentiation on the basis of immediacy of appearance was possible. The difference in the results is easily explained when we consider the two situ-

ations. When dealing with sensational content, the attention can turn away to something else, provided no threads of associations are found to radiate from the stimulus. With the image, on the other hand, the conditions of the experiment are such that it is made the focal point and the center of operation. The mind dwells on it as the result of the instructions and the effort to manipulate the content. Consequently associates are bound to appear. For there is no content about which we cannot think something, in which relations of similarity to other experiences are not observable. The notable fact is that in spite of being deprived of this criterion, the other points of difference give us a method of distinguishing the two phenomena.

There is one other point worthy of note, the rarity of movement in visual images. We found it but six times. It is not limited to either type of image.

14. *Feeling of Familiarity.* We are unable to find any such thing as an elementary feeling of familiarity. C. and Bh. could isolate nothing except the differences in organic sensations already reported. Bo. was more conservative in this matter, but at no time could find any elementary feeling of familiarity. He once or twice said that he could not be sure that there was nothing present except organics; but on the other hand, he often denied the existence, as far as his introspections went, of any such element. Nor were organics present at all times. We found in a number of instances that Bo. denied the presence of either organic sensations or feeling tone and reduced the whole matter to cognitive reference. We already pointed out that our present mode of procedure was especially adapted for studying the feeling of familiarity if it existed, and hence our conclusions in this matter assume even more weight in our eyes. When we consider that in the overwhelming majority of cases of perceptual recognition, no organic sensations were present, we must come to the conclusion that a so-called feeling of familiarity rarely if ever played any part in the results. We firmly believe that those authors who have spoken of a feeling of familiarity have failed to differentiate between psychological content and meaning. What we really have is a consciousness that we have

or have not seen a percept before, or that an image does or does not refer to previous experience, and that this is a consciousness of reference, a meaning, and not a bit of existing content.

(3) Conclusions

We are then unable to substantiate in any way the position arrived at by Perky. As far as our evidence goes (and in the case of Bo. it is of a good deal of weight), eye movement occurs with imagination images as well as memory images. Surprise is in no sense the mood habitually accompanying imagination images. The feeling of familiarity is no more from a structural point of view than a peculiar organic background plus the meaning that the content represents or refers to a past perceptual experience or experiences, or the meaning that it does not do this. The images of imagination are often unstable, are less likely to be colored with some subjects (Bh.) and are more fleeting than images of memory (when there is any difference here). There is no evidence of organic empathy or of imitative movement. Images of the imagination are not more quickly aroused, suddenly and as a whole, but rather involve delay, effort and continued directive control by the subject. They are not less changeable than images of memory, but more so, when any difference exists. There is no observable tendency for the memory images habitually to stir up associations, but they often do. The imaginary products also do the same. It is of course a question how far our results are strictly comparable with those of Perky. The criterion of differentiation that we employed was that with memory images the subject was conscious that he had experience either that particular individual represented or objects of the same general class, while in imagination the image represents something which has never had a counterpart in his perceptual world. This involves the personal reference of Perky. The specific localization in time and space is, however, not called for. As a result, it is entirely possible that we are not dealing with the same thing.

In contrast, however, to the results reported by Martin and Ogden, whose criteria are quite similar to our own, we find

certain well defined differences to exist in the two types of images over and above the difference in meaning. Some of these differences are common to all our subjects; others vary from individual to individual. Moreover the same differentia are not always present. The point is that *some* difference is always observable. The following is a list of differences. The first four are common to all subjects. With the remainder we have indicated the subject reporting the factor.

Imagination Images	Memory Images
Effort and difficulty of arousal	Ease of arousal
Delay of arousal	Immediacy of arousal
Instability in space	Stability in space
Permanency when desired	A tendency to fade out against the will of the subject
Lack of color	Color (Bh.)
Lack of proper proportion	Correct proportion (Bo.)
Lack of three dimensions between parts	Three dimensional character (Bo.)
Filmy and vaporous character	Clear cut and distinct (Bh.)
Difference in the motor reaction (C.)	

An examination of these factors indicates clearly that the characteristics of the imagination image are those normally accompanying content where habitual relations do not exist, or better where they are being established. There is less of a concrete, perceptual character, absence of color, or three dimensions, or a filmy tone. The images do not appear automatically and quickly and without effort. In fact they exhibit many of the properties of reactions which have not yet been thoroughly automatized. On the other hand, memory images partake of the general pattern of habitual reactions. The automatic character and the approach to the characteristics of perceptually present content is striking all the way through. In closing, we note once more that individual variations exist.

X. SUPPLEMENT TO EXPERIMENT VII

In the course in qualitative experimental Psychology in the Chicago laboratory, the following experiment has been given for the last three years.

Directions. In the exercises are given pairs of objects: one a customary or memory object, and the other a novel or imaginary object. The experimenter picks some pair and requires the subject to visualize as vividly as possible the two objects a number of times in alternation. The subject compares and reports as to all differences in the character and behavior of the two visual images. Note such things as ease and quickness of arousal, stability and persistence after arousal, emotional attitudes involved, tendency to arouse supplementary strains of thought, etc. Experimenter secures introspective records for fifteen pairs chosen at random from the list. From these records generalize as to any constant subjective differences between the two functions upon which one's discrimination between them may be based.

The character of the pairs used is highly similar to those of our test. We give below the reports obtained from four of the more careful introspectors, in this year's class, (spring, 1914). These records were selected by the instructor in charge.

Subject	*East and quickness of arousal*	*Stability*	*Persist*	*Emot.*	*Assoc.*
G	M yes I no	I no		M yes I very few	M yes
C	M yes I less		M yes I no	M yes	M yes
D	M yes I less	M yes I less		M pleasant I often unpl.	M yes I yes
R	M yes I less	M yes I less		M Pl. I 66⅔% 33% unpl.	M yes

Again we find that memory images are more easily aroused, are more stable, and sometimes more persistent. The associations appear more uniformly with memory images, though some are noted by D. with imaginary products. Both G. and D. speak of the tendency for memory images to come as wholes, while imagination images are built up gradually from familiar nuclei. G. in addition reports that he was practically unable to visualize certain of the novel complexes at all. D. and R., who took note of the affective tone, report more pleasant reactions with memory. Still pleasantness was noted with imagination products also. R. was explicit in his statement (voluntarily offered) that the unpleasantness of the latter was due to the effort involved. Professor Carr tells me that these selected results are typical of the usual reports of all classes.

XI. GENERAL CONCLUSIONS

As a result of our experiments, we reach the following conclusions regarding the phenomenon of recognition:

Recognition on its meaning side (the *what* the subject is aware of) is the name applied to one of the two ways in which objects may be cognized from the point of view of their relation to the individual's past. Any stimulus may be classified as old or new, and this classification is a meaning or cognitive distinction on a par with numberless other meaning distinctions. Each of these reactions is a positive thing, neither one consisting in the mere absence of the other. The term re-cognition indicates that the stimulus is cognized as old, not that there is a unique process involved which is in no way related to any other psychological phenomena. Judgments concerning the oldness or newness of any content refer to one or a number of specified relations betweeen terms. The terms themselves are generally familiar. Even when dealing with memory and imagination images we must accept the truth of this statement. As a general rule we have no interest in the image itself. Rather it is classified as a product of memory or of the imagination in so far as it represents a relation that has been perceptually experienced in the past or which has had no such counterpart. The present image is the way we represent to ourselves and its peculiarities are (as we have seen) criteria by means of which we decide concerning the oldness or newness of relations which are being, at least tentatively referred to the past content of perceptual experience. The image is the means by which we think the relations and the terms. In some few instances, of course, the earlier experience with relation to which the present image is being classed, is itself an image. The question is, not does the present image represent a past percept, but does it represent an earlier imaginal complex. This happens but rarely, and is a phenomenon that forms no exception to the statements made

above. The only difference is that the past object with which the subject is concerned is ideational. We may then conclude that in the case of perceptual recognition we judge that an objectively existing relation is or is not altered while in the case of recognition on the ideational level, we judge that a represented relation is or is not altered. In both instances the meaning may be mediated by images, or it may be mediated by sensory activities. It is then a question of whether the perceptual object of the judgments is present or not, not of any fundamental difference in the meaning character of the reaction in both perceptual and ideational recognition.

We do not deny that additional specifications may be laid down which the object must fulfill such as a reference to a definite time and place, but these are not necessary to recognition as such. They are further refinements within the larger area and make the qualification more definite. This personal reference, although always present, need not be explicitly formulated in the subject's consciousness. He may for instance say "I know that man." Here no overt declaration of previous experience is contained, but it is self-evident that it is implied. But the judgment "I have seen that man," expresses the relationship explicitly. This personal reference, the awareness of pastness or of novelty with regard to personal experience is the minimum meaning that is necessarily involved. The fact of this meaning, the fact that a present content can transcend itself, can refer to the past, is an ultimate. This statement does not overlook the fact that the cognitive distinction is mediated by content differences, or that (as we shall see) the relationship between these two phases (content and meaning) is probably due to experience. In this sense, of course, the phenomenon is not ultimate. But that the mind should, even on the basis of experience, be conscious of its past, that it should possess the power of fathoming the meaning of the criteria which present themselves, and of judging with reference to a situation which is no longer present, this is one of the unanalyzable givens of psychological science. In fact, it seems highly probable, that some at least, of those who have defended the doctrine of an

unanalyzable and ultimate and hence unmediated recognitive reaction, have really been concerned with this transcendent phase of meaning exclusively.

Although we conceive of the cognition of pastness and of novelty as an unanalyzable datum of the conscious life, our results are opposed to any doctrine which would maintain that these distinctions are not mediated by peculiarities of present content. We have found that there are differences in the manner in which this mediation takes place and have been able to arrange the judgments returned under distinct headings on this basis.

The subject may or may not be conscious of the fact that such mediation has taken place, or even when he realizes that this has occurred he may be unable to isolate the particular phase of the content that is concerned. He can never know directly of the mediation when the perceptual content itself is the sole basis for the reaction. This is, as we have pointed out earlier, due to its given and unyielding character. Provided no additional elements of content are brought into play, an object, presented from without is the same stimulus characterized by the same qualities and relations (of a type which can be noted at the present moment) for the man who has seen it earlier as for him who has not. Under these conditions, even though the stimulus be the guide for the cognitive classification, all that the subject knows is that he reacts to it, but he can only justify himself by saying that he believes his judgment to be correct. He cannot point out any reason for his judgment beyond the faith in its trustworthiness. With factors of content other than the percept, the subject may or may not realize at the time that they are guiding his decision. He may say "Here is a visual image, therefore this is old," or he may judge the stimulus old, unconscious of the rôle of the image. The more habitually criteria are employed, the more likely they are to escape notice. This will account for many grounds for the old-new cognitions being overlooked. Then again, as we shall see, many of these criteria are relative matters, which are everywhere difficult to isolate.

Returning to the differences in the manner in which this

mediation takes place, we found that with many judgments the meaning is attached to the perceptual content directly, *i.e.* there are no peculiarities of structure outside of those involved in the perceptual content itself, which are found accompanying the consciousness of reference. The characteristic thing about these judgments is that they come immediately and are felt by the subject to be unquestionably correct. We have two reasons for believing that we have here truly mediated decisions. In the first place the correlation between unaltered perceptions and old reference, and altered percepts and cognitions of novelty is very great. This is to say that the judgments are generally correct, the perceptual content and the meaning standing in one to one relationship. If there is no true mediation, how can this be accounted for? In the second place, we find that where the judgments did not appear immediately, where, therefore, the percept was unable to produce a reaction, and a period of doubt succeeded unrelieved by ideational criteria, the content was normally classed as new and the judgments were incorrect in over 50 per cent of the cases. When an appeal to content other than the percept is made, and this is not rewarded by the appearance of definite criteria, the subject will regard absence itself as a criterion of novelty and will be misled. They are bound to choose some criteria good or bad. But with the judgments where we believe the stimulus itself to control the reaction, there is a great degree of correctness observed and the old and new responses are approximately equal. There is some reliable guide both for novelty, and past reference. What besides the percept can furnish it? The advocates of unmediated consciousness of reference can find no comfort in these cases. A priori we see no reason why perceptual content may not guide cognitive reactions, and in this instance we are convinced that this is the true explanation of the phenomenon under discussion. Also the only argument against the doctrine is the absence of any sense of mediation and this is fallacious.

These judgments mediated by the objective stimulus itself represent we believe those cases where the habitual character of the old content and where the non-habitual character of the al-

tered stimulus is most strongly felt. Our belief that this is so is justified by the facts, (1) that the judgments come immediately (2) that the subject is so sure of his answers. The status of the situation is so marked that the subject never appeals to more reflective criteria, never hesitates about his reply, and never thinks of the possibility of error. Where old content then, for any reason whatsoever, has made a deep impression or new content is decidedly out of harmony with the subject's general memory of the past, the percept itself is sufficient to bring home the fact.

On the other hand, it often happens that the perceptual content itself is not able to mediate the cognitive distinction. Doubt characterizes all such judgments. Under these conditions we have found that the differences in meaning are paralleled by differences in content other than those involved in the stimulus. This is always true in recall (no percept present) and in cases where visual images of imagination or of memory are concerned. The content side seldom if ever consists in a peculiar structural element, a feeling of familiarity or strangeness. If we confine ourselves for the present to judgments concerning percepts, the criteria may be classed as positive or negative. By positive criteria we understand concrete phases of the conscious pattern which serve to guide the subject in his reaction. Such are: (1) A motor clinch or tendency to go out towards old content and a feeling of withdrawal with new; (2) certain moods, which are very rare and are practically always correlated with other more significant criteria (a feeling of familiarity is not here included); (3) visual images which furnish a number of modes of differentiation among which we call attention to (a) mere appearance; (b) stability vs. instability in space; (c) locus in space, old content appearing where it was formerly seen, new where the re-presented series is exposed; (d) the appearance of a partner different from the one re-presented with an individual; (e) quality, a visual image of the stimulus was useless, one representing a different combination led to a judgment of novelty; (f) immediacy in arousal, an image of the presented content which came immediately was accepted, while a delayed image

was useless; (g) failure to submit to manipulation led to a judgment of novelty; (h) mode of entrance, images coming in piecemeal and not as a whole, led to a rejection of the content they represented; (i) an artifact character which led to the rejection of the content imaged; (j) the relative completeness, permanency, and persistency of the images of possible alternatives; (4) associations which furnish the following basis of judgment, (a) mere appearance resulting in judgments in accordance with their implications; (b) immediacy, immediate associates leading to the acceptance of the content with which they appeared, delay resulting in a judgment of novelty; (c) quality, the names of geometric forms and of colors are useless; (d) in cases of conflict, the association leading to a long line of subsequent ideas triumphed; (5) rhythm; (6) relative strength of motor reactions; (7) relative ease of articulation; (8) tendency to attract the attention. This constitutes a complete list of the positive criteria used when the subject was forced to decide concerning the oldness or newness of perceptually presented content. No subject used more than a few of them and the same subject often used different ones with the different problems, known vs. unknown series, and different alterations.

As opposed to these positive criteria, we distinguished so-called negative criteria. Stimuli which failed to arouse associations, visual images, or any of the positive types of content were judged new. A few exceptions were noted, the subject looking upon some objects unaccompanied by the above as old. We have given reasons for believing that in these instances one of three explanations will be found to apply: (1) The observer failed to note positive criteria of the types enumerated; (2) he failed to isolate unusual bases of judgment which our concepts were not of assistance in calling to his attention; or (3) he disregarded the usual implication of the isolation of the percept, being well aware that a negative criterion was not very reliable, but often resulted in an erroneous reaction. Unlike the positive criteria, the negative were found to be used by all subjects.

We have already repeatedly pointed out that these criteria,

positive and negative, may be looked upon as embodying the working of the principle of habit. Those leading to judgments of old are characterized by properties which we would anticipate with habitual relations between content, while those conducive to judgments of novelty show the pattern of habit violation.

Invariable concomitant variation always indicates some kind of a causal connection between the factors involved. The exact nature of the relationship is, however, not so easily determined. We cannot say which of the variables is the cause of the other, unless there is a highly unambiguous relation of temporal succession observed, nor can we be sure that they are not both effects of some deeper lying single cause. Especially is the problem difficult where we are dealing, as here, with phenomena whose temporal relations are seldom clear, and which are so subtle and hard to grasp. We are then frankly unable to assert in any dogmatic manner that the peculiarities of structure which we have established are the causes of the judgments returned and not vice versa. We have previously set forth a number of reasons that inclined us to this view, and we note but three of them at this point. In the first place, it is hard to believe that the mind which exhibits such a tendency to economy, carries around a whole lot of useless material. Why, if the structural differences are really superfluous, do we not have unmediated meaning under all circumstances?

In the second place, the fact that in many cases the subject looked upon these content differences as mediating the judgments is of some value. It is undoubtedly true that the observer is sometimes mistaken as to the stimulus responded to. Generally he must be regarded as knowing the real condition of affairs, especially when a large number of subjects pick out the same elements of content. In the third place, the so-called criteria were observed in cases of doubt, while when the decisions were very certain, they were often lacking. Does this not seem to suggest a relationship between their appearance and the obvious need for aid in meeting a difficulty?

We have enumerated the criteria employed in perceptual rec-

ognition, *i.e.*, in judgments where the object cognized is present to sense. These cases differ from recall in that in the latter, no hard unyielding content is given from without. The subject must summon the idea (or perception) which represents the earlier experience. He not only accepts what he judges to be old, he must first find what he is to accept. This difference admits of a number of new factors, such as order of appearance, ease of arousal, etc., which we might expect to furnish grounds for deciding what the earlier experience actually was. We give below a list of the criteria we found operative in guiding recall: (1) Mere appearance of a single possibility led to its acceptance; (2) relative assertiveness of the visual images of possibilities; (3) the arousal of associated visual images representing the earlier circumstances; (4) primacy in time; (5) relative assertiveness of the idea, however carried; (6) the introduction of associates; (7) ease of articulation; (8) ease vs. difficulty and immediacy vs. delay of arousal; (9) construct characters of the visual image, its length, its fleeting character, its completeness, and its clearness; (10) congruency with a larger context. We note that many of these factors are the same as those concerned with perceptual recognition, and that those which appear here for the first time are such as can be explained as due to the difference in the problems mentioned (primacy in time, ease of arousal, etc.). This substantiates, we believe, our introductory hypothesis that there is no fundamental difference between recognition on the perceptual and ideational levels, in respect to the mediating processes concerned.

Returning now to recognition on the perceptual level, we found in addition to the judgments where the meaning was a function of the percept and to those characterized by doubt and subsequent use of reflective criteria, intermediate cases where there was an initial inclination in one direction or the other. These were obtained by shortening the time interval between the successive presentations. They differ from the first judgments in that these involve no subsequent appeal to criteria while in these intermediate instances such an appeal is usually necessary, and from judgments of the second class in that the

initial inclination is normally correct. With the truly doubtful decisions of the type mentioned earlier, whatever immediate reaction appears is both useless and unreliable. We have thus a gradation from cases where doubt and a subsequent decision owing to peculiarities of content are found, up through cases where an initial inclination is subsequently verified, to instances where the meaning is a function of the percept itself. This phenomenon reminds one of the characteristics of habit in other fields. In motor learning for instance as the process nears perfection, the conscious control becomes less and less. In our work, the more deeply content is impressed at the time of the earlier presentation, the more the meaning distinction tends to be a part of the perceptual "Auffassung" itself, allowing the subject to dispense with an appeal to more reflective aids.

In addition we note three points which we believe our experiments establish. (1) In recall, the congruency with a larger context has a decided influence in determining what the subject will accept as a representation of the past. (2) The same general criteria are employed where the subject has no opportunity to work over a stimulus in a highly reflective manner as when he may do so. The bearing of this on all arguments for an ultimate consciousness of reference based on experiments with distractions is obvious. (3) Visual memory and imagination images are distinguished by certain peculiarities, the list of which appears on page .

We have thus substantiated the following assumptions with which we entered the work, (1) the existence of a parallelism between meaning and content; (2) the differences of content underlying the judgments are such as we would expect to find if we assume that the habitual and non-habitual characters of old and new should respectively find expression in peculiarities of structure; (3) the cognition of oldness and the cognition of newness are both positive things and are in every way similar processes; (4) the cognition of oldness and newness on ideational and perceptual levels is in most respects one phenomenon. Moreover, the technique employed involving (1) an appeal to doubtful cases and striking violations of habitual relations, (2) reliance not entirely on the subject's own introspections but on

concomitant variations, and (3) the varying of but one relation at a time, which can be indicated to the subject, has justified itself. No other means would have admitted of a truly reliable study.

The question now arises, how do the particular characteristics of content cited come to be correlated with the meaning differences. We have already pointed out that the fact of past reference is ultimate and that on the other hand these reference values are probably due to structural criteria. How do these two phases ever get woven together. We would answer, "in the give and take of experience." This does not imply for a moment, that we have first bits of content and then attach meanings to them. All content has some kind of meaning from the beginning, *i.e.,* it tends to set up reactions even though they be purely motor and uncoördinated. We know that children are relatively unable to distinguish the products of their imagination from those of their concrete experience.[1] Moreover, as the work of C. and W. Stein[2] has shown, conscious recognition of persons, while it appears early, is uncertain during the first years. Also recognition after an interval of a number of weeks is not noted until the end of the first year. But we know that long prior to this, the child can react to repeated stimuli or similar stimuli in the manner that he has learned by the trial and error method. In the course of experience, he must inevitably find that even among similar objects there are differences in the success of his reactions. All men do not respond like his father and all dogs are not his friends. In the grim school of experience then he must gradually come to a hazy awareness of the difference between old and new. And the same is true of imaginary objects. His trip to the moon when regarded as fact does not lead to anticipated results. The capacity for making this distinction on the basis of experience we must accept as ultimate, but how it comes to function seems fairly clear. Now accompanying these failures and successes when the child proceeds as though most ideas were memories and all like

[1] Meumann, Vorlesungen, I, 2nd edition, 1911, p. 518.
[2] *Ibid.,* 433.

stimuli old, there are, we believe, differences in content. And these differences of content gradually come to guide the child in his distinctions on the meaning side. This is not brought about in a *discriminating* manner any more than the rat picks out certain phases of the situation and consciously reacts to them. But by a method of trial and error, some structural properties when present admitting of successful habitual reactions while others if met in the same way lead to unpleasant consequences, association by contiguity establishes the relationship between such factors and a classification with respect to oldness or newness. That there is such a growth in the power of correct cognition is attested by the fact that the child only gradually distinguishes between memory and imagination. And that the correlation is established blindly, so to speak, seems to follow from the fact that even in adult life the subject cannot always isolate the criteria which he is using. Witness also the many theories of recognition that have been propounded.

This explanation of the manner in which certain structural peculiarities come to carry past reference renders intelligible the use of different criteria by different subjects, and by the same subject when dealing with different problems, and the fact that he is not consciously aware of the criteria on many occasions. It is easily understood that diverse factors come to be correlated with differences in meaning in the course of the experience of individuals. The give and take of life will emphasize different aspects of the content with the observers and with the divergent tasks presented by the problems in hand. And from this the cases where the criteria are disregarded may be understood. As the correlation is set up in experience and is brought about more or less unconsciously, we can well comprehend that it is never complete and perfect. The individual is constantly tending to overlook the dictates of his experience. One cause of this lies in the nature of the criteria themselves. They are modes of behavior, immediacy of arousal, stability, etc. Such distinctions are of course always highly relative. Hence the subject may react to a relatively immediate experience as though it were moderately delayed and later report that it was immediate. As a result, we record an exception.

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